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ABSTRACT

This final report summarizes the activities of Project Environmental Studies Program (ESP), a program designed to provide environmental education resources to teachers in the forty-nine Texas counties that make up Educational Personnel Development Consortium D. The project involved selected teachers in the formulation of a model for the development of environmental education curriculum and called for involvement by the school faculty in the selection of environmental education concepts. The curriculum developers then acted as multipliers by providing inservice education in their buildings and within the local school systems, as well as other schools in the consortium. This report details the development and validation of the multiplier model for teacher inservice in environmental education and presents examples of materials and activities developed by teachers for immediate use in meeting student needs. A dissemination network with the Texas telecomputer grid, developed to disseminate developed materials, is described. Evaluation criteria and instruments, rationale, fundamental concepts, and representative learning activities are included with this report. Results from the field testing of developed materials with secondary students are detailed. (BT)

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FINAL REPORT

ENVIRONMENTAL

STUDIES

PROGRAM - 1977

EPD Consortium D
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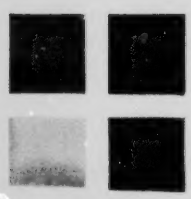

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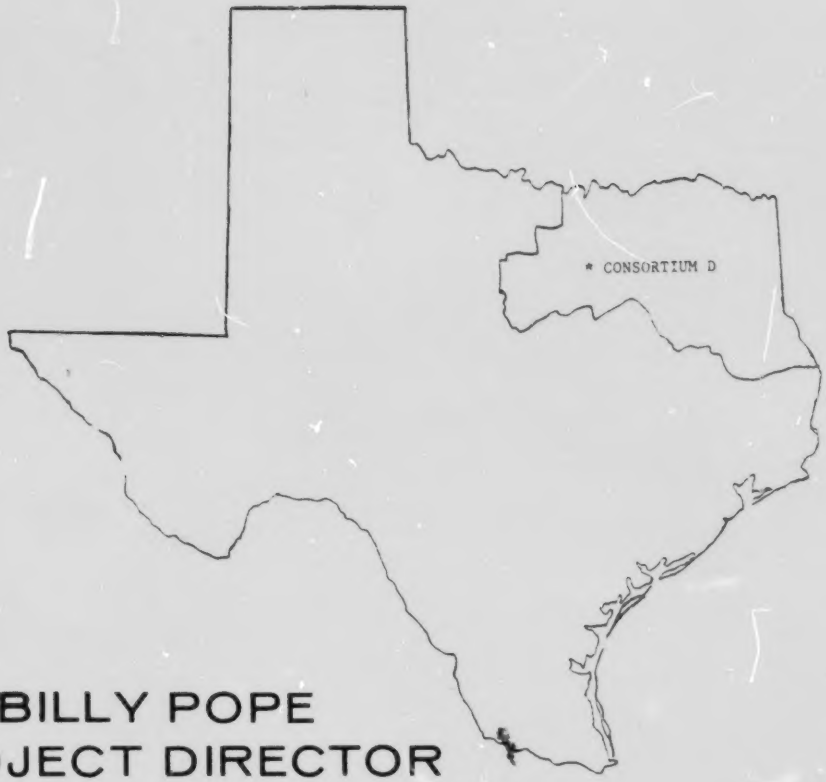

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E N V I R O N M E N T A L S T U D I E S P R O G R A M

Final Report
Grant #G007601990

1976-77

Presented to

U.S. Office of Education
Division of Environmental Education

By

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July, 1977

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Forward

During 1976-77, Environmental Studies Program participated with the Richardson Independent School District to conduct a project designed to meet the intent of the environmental education guidelines. The purpose of the project was to support the development of educational processes dealing with man's relationship with his natural and man-made surroundings, and include the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment. These processes would be designed to help the learner, both to perceive and understand the concepts of "environment" and environmental principles and problems, and to be able to identify and evaluate alternative solutions to environmental problems with emphasis placed on the development of skills and insights needed to understand the structure, requirements, and impact within and among various environmental entities, systems, and subsystems.

The results of this project are in the following report. Teachers participating in the development and validation of activities found in this report were:

Berkner High School	Katherine Goodbar Cathy Miller
J. J. Pearce High School	Mary McBride
Richardson High School	Ginger Mayo
Lake Highland High School	Windy Windstead
Forest Meadow Junior High School	Richard Bass
Lake Highland Junior High School	Vicki Keathley Lane Peters
Liberty Junior High School	Sally Fox
Northwood Junior High School	Yvonne Nickerson Jim Stephens
Richardson Junior High School	Ron Studdert Kathy Wohlgehagen
Richardson West Junior High School	Diane Stephens

Westwood Junior High School	Charlotte Klenk
James Bowie Elementary	Nancy McDaniel Roger Renfro
Dartmouth Elementary	Mary Baird
Greenwood Hills Elementary	Maxine Daniel
Mark Twain Elementary	Donnie Ickles
Spring Creek Elementary	Janice Clevenger Neal Frindell Bonnie Mitchell
Terrace Elementary	Jennie Vahrenkamp

Special thanks go to Mr. David Olson, the Secondary Science Consultant for the Richardson schools, and Mr. Gene Peer, leader of Team C Elementary Consultants for Richardson schools. It is only through the efforts of Gene and David that this project was able to meet and exceed its goals and objectives. Environmental education needs the dedicated leadership of administrative and support staff to be able to meet the educational needs of children of the future.

Mike Owens
Environmental Facilitator

Final Report for Environmental Studies Project (ESP)
United States Office of Education Grant #G007601990

Introduction

During 1976-77 Project ESP has directed its efforts toward the validation of the multiplier model for teacher inservice in environmental education and the development of a practical product for immediate teacher use in meeting student needs relative to the environmental concerns matrix and to develop an institutionalized dissemination product. The benefits of the project were in compliance with the proposal as developed and additional benefits were obtained. In general the project was able to establish a successful teacher education inservice model that will be implemented in two additional school districts in the following year. The product for teacher infusion of activities to meet students' environmental concerns has been well received by the participants and the professional education community as well. The dissemination network with the Texas telecomputer grid has been successful as far as possible considering the limitations of the computer network and an alternative system via the four service centers to the 43 counties served by the consortium and has been well received. The resource library has been well used and has had considerable support from private industry and colleges and universities in the donation of resources for inclusion in the library.

Multiplier Concept

During the 1976-77 implementation phase Project ESP relied on the multiplier implementation model, see Illustration A, to install the components of training. The model uses the Trained Leaders (TL) from the schools and the staff to conduct summer environmental training conferences (ETC). These training conferences were three days in length and involved persons from the U.S. Forest Service, the Texas Parks and Wildlife, a university wildlife biologist from Texas A&M

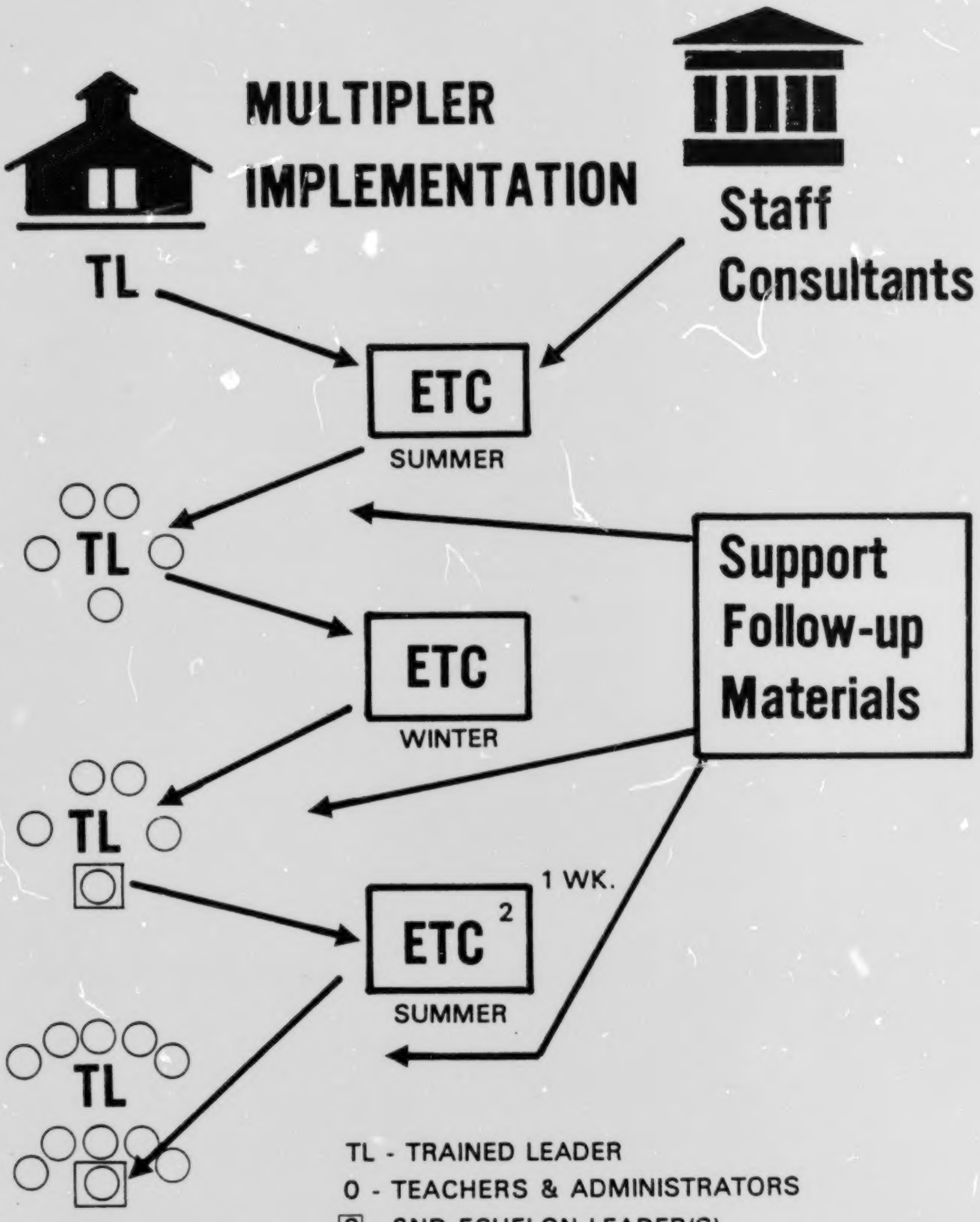

Illustration A
2

University, the environmental curriculum leaders from the local schools and the Project ESP facilitator. Once complete with the ETC conference a second level of teacher leaders were identified. These TLs conducted local building inservice during the fall and winter. The TLs conducted local building inservice during the spring of the year and informed other teachers of the materials available and of possible uses for the local environmental study center. From the recruitment of the TLs a second echelon of leaders was identified to participate in a second summer ETC conference to be held August 10-12, 1977. This conference will provide for a second level of teacher leaders capable of informing teachers in their local building of the resources available from the local school and Project ESP. These teacher leaders are responsible for conducting awareness workshops within their local building and in other requesting school districts. Currently 24 of these TLs are available and will be servicing requesting schools from the four regional service centers during 1977-78. This implementation model has been accepted by the Plano ISD and initial implementation has begun with the summer environmental training conference planned for the first week in August, 1977. These participating schools are aware of the benefits of teacher to teacher explanation of programs and resources in environmental education. Due to the multidisciplinary nature of the curriculum and the environment it is important that teachers representing a wide range of elementary and secondary academic fields be involved as TLs and in the conducting of the multiplier workshops.

Environmental Training Conference

The initial component of Project ESP was a summer Environmental Training Conference (ETC). A total of 36 teachers from three school districts were in attendance. This three-day workshop used resource personnel from the Texas Parks and Wildlife Department, Texas Forestry Service, the U.S. Soil Conservation Service, and a professor of Wildlife Biology from Texas A&M University.

The ESP Workshop was conducted from August 11-13, 1976, in Richardson, Texas. The workshop schedule demonstrates the plan of the daily meeting the participants were invited to attend. Fifty-six persons were sent invitations. Of the invited persons, one was with the Dallas ISD and one from the Irving ISD. The others were with the Richardson ISD. Thirty-six persons were able to attend the first day of the workshop.

The workshop included a mix of on-site activities, classroom instruction relative to the on-site activities and a demonstration of currently available teaching materials and methods in the Environmental Sciences. The workshop was evaluated at the beginning of Friday.

The forest activities were focused around the use of A Guide To Large Woody Plants. The guide was given to each teacher and a tour of the marked site was made by the participants. In addition to close examination of the trees, explanation of their commercial uses and the possible reason for their present condition was given. The area has a pronounced browse line due to over grazing two years ago. The classroom phase suggestions included displays of books and pamphlets available to teachers for addition to their library. Manipulative samples of Texas woods, Pine Bark Beetle, damaged wood and bark were displayed. An explanation of tree rings and some suggestions about how to use a tree cross section were given. The Forest Service activities on the site were given a higher rating as to presentation than the classroom presentation. The mean rating of 4.58 of the on-site content phase indicates that teachers felt the information is most likely to be used. Participant response to the classroom was strongest in the appeal of the content.

Water activities conducted by the Texas Water Quality Board were held in the creek and on the bank. There was a demonstration of how to check for the oxygen level and the ph of the water. Visual observation of the stream, the

banks, and the induced materials were made and recorded. Teachers went into the stream to collect and classify organisms found under the rocks and along the stream bed. Suggestions were made about how to measure stream flow and volume. Water activities in the classroom consisted of a movie of the various services of the Water Quality Board and the various aspects of water use and misuse. The presentation of this group was lowest of all groups due to the reading of the presentation to the teachers and the use of some vocabulary that was not familiar. The content was considered more essential than the information on large woody plants indicating strong teacher concern for water quality.

The soil activities on site consisted of a study of the effect of rain on soil with no cover ranging to a thick grass population. Teachers were given a map of soil on the site and taken on a tour of the site soil layers. Core samples were taken to expose the clay. Soil activities in the classroom phase included the use of the USDA guide to soil activities that was provided and several of the experiments were done. Samples of Texas soil that can be found in the metroplex were provided and tests for acidity were run by the participants. The classroom phase stressed the ease of working with the soil with limited facilities and provided confidence to the teachers to try their luck at some of the experiments in the USDA publication. The content was considered to be essential, yet the presentations were not strong when considered against several other presentors.

The wildlife activites were designed to point out potential observation sites and trapping sites that teachers may consider using. There were some direct observations of wildlife but most of the work was done with evidence of wildlife such as the browse line and the lack of foliage on some limbs. Specific plants that are part of good wildlife food sources and cover were

identified. The classroom phase consisted of slides of the wildlife management scheme developed and carried out in a west Texas area farm and of the various types of Texas wildlife. The presentation had one of the highest ratings and displayed the teachers' concern for the wildlife. Content applicability was also high relative to other content areas.

The classroom phase had the highest rating relative to content being essential and high rating in the area of presentation. Dr. Ray Quinn presented two programs for the teachers. The OBIS, Outdoor Biological Instructional Strategies, Set I and Set II were presented to teachers for inspection. One of the activites from Set II was selected for the participants to engage in and was well received. A slide set was accompanying the presentation. The results of a study of the wildlife on the outdoor site was given to the teachers and explained. Teachers were allowed to purchase OBIS packets and seven sets were sold to participants. The second presentation was of the environmental instructional materials developed by the Harris County Environmental project. This material was explained and offered for inspection. Teachers were made aware of the availability of this from the science consultant. The workshop was by-and-large a success to the participants.

The Friday presentation included the distribution of the resource packet and an explanation of the nature of Project ESP. A call was given to allow teachers to volunteer for the ESP core teacher inservice and an outline of possible uses of the facilitator was given. A large number of free material not included in the listing was available for inspection and teachers requested these to be sent separately. The material Dr. Quinn had was available. Learning games available from the local school district were on display for the teachers to use and learn the directions. The Essence materials from Addison Wesley Publishing Co. were displayed. Material and assistance was

provided for teachers wishing to laminate materials at the time. Teachers assembled materials for the media person to laminate for later delivery.

The public was informed of the workshop activities as a result of the article in the Richardson Daily News on Thursday, August 17, 1976. The total means for each of the teacher groups and cross group totals are included in the attachment for information. The environmental workshop was followed by two presentations for Richardson teachers to learn about the workshop and to volunteer as core teachers. A total of 24 teachers have received permission from their building principal to attend ten days of intense inservice curriculum development and product testing. The first meeting was planned for September 14, 1976, and the advisory board met September 15, 1976.

TEN-DAY ETC INTENSIVE WORKSHOP

From the 36 ETC participants 24 teacher leaders were selected for the eight-hour intensive workshop held on ten independent days throughout the year 1976-77. In evaluating the overall effect of the intensive workshops, the participants were asked to rate the workshop (see Evaluation form, Appendix A) from 1, as poor, to 7, as excellent. The results of this are seen in Figure 1. The highest rating of 6.55 was given to the work of the consultant facilitator. The lowest rating of 5.80 was given to the objectives. All of the means reported indicated a very positive feeling on the part of the participants toward the workshop as a whole. The mean rating of 6.2 for the workshop as a whole is consistent with the individual rating given by participants for various workshop aspects. The rating did indicate a need for more information about the subject. It was a hope of the project that there would be new unanswered questions that would help build momentum for the teachers' future work.

A second component of the evaluation instruments seen as Figure 2 provided the participants an opportunity to rank the components of the workshop

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Project ESP Core Workshop
Final Evaluation
March 15, 1977

EVALUATION CRITERIA

1.	The organization of the workshop was:	Poor 1	2	3	4	5.95	6	Excellent 7
2.	The objectives of the workshop were:	Vague 1	2	3	4	5.80	6	Clearly Evident 7
3.	The work of the consultant(s) was:	Poor 1	2	3	4	5	6.55	Excellent 7
4.	The ideas and activities presented were:	Dull 1	2	3	4	5	6.37	Very Interesting 7
5.	The scope (coverage) was:	Inadequate 1	2	3	4	5.89	6	Very Adequate 7
6.	My attendance at this workshop should prove:	No Benefit 1	2	3	4	5	6.4	Very Beneficial 7
7.	Overall, I consider this workshop	Poor 1	2	3	4	5	6.2	Excellent 7

8. Do you feel a need for additional information about the topic?

1. Yes 70%

2. No 30%

Figure 1

Please rank the following activities as to how they helped you in developing material, understanding environmental education, or getting ideas for teaching.

	Not Needed				Very Benefical
Learning one another's names	1	2	3.65	4	5
Dr. Stanford's talk	1	2	3	4.56	5
The Addison Wesley Publisher (Essence)	1	2	3.00	4	5
The Learning Games: DNA, Blood Clue	1	2	3	4.11	5
Visit to environmental study center	1	2	3	4.70	5
Jim Stephen's Slide Story	1	2	3.72	4	5
Sharing OBIS activities	1	2	3.63	4	5
Publisher presentations	1	2	3.11	4	5
Ron Studdard's slide story	1	2	3	4.17	5
Laminating leaves	1	2	3.37	4	5
Time to travel to other places	1	2	3.76	4	5
Dallas Museum presentation	1	2	3	4.65	5
Developing study guides for the center	1	2	3	4.25	5
How to present on inservice	1	2	3.88	4	5

Figure 2

throughout the year. The means were calculated on a ranking of 1, as not needed, and 5, as very beneficial. The highest rating of 4.70 was for the visit to the environmental study site. This activity allowed the participants to develop hands on skills in the environmental study center they were developing materials for. The second highest rating went to the Dallas Museum of Natural History presentation relative to their services and closely followed was a talk by Dr. Geoffery Stanford. Dr. Stanford is a futurist at the Greenhills Center, Environmental Research Center. Dr. Stanford stressed the schools' use of around-the-school in environmental studies and to allow the resources close-at-hand to provide learning opportunites for students. The lowest rating was a presentation by a publisher. The commercial publishers spoke to only two of the sessions and they were not well received. The facilitator removed the commercial presentations from the inservice programs after the second program based on participant response. The evaluations of the workshop programs indicate that in general they were considered beneficial and none were considered not needed. The limited range of scores indicated that the workshop presentations by-and-large helped meet needs for a majority of the participants.

Teachers were asked to offer comments as to the strongest features of the workshop. They were:

- Meeting people from other schools and sharing their ideas and problems.
- Development of projects.
- Dr. Stanford's talk and the Dallas Museum educated us as teachers and gave us some very specific activities and ideas.
- Information received from outside resource people. Learning of available material resources.
- Providing a classroom teacher with opportunity to review all the environmental activities that are available.

These comments indicate that the interaction among the cross-disciplinary multi-level of the participants was an advantage. Additionally, the guest experts and cooperative efforts of the group were successful components of the workshop.

Teachers were asked to offer their comments about the workshop as not previously evaluated. These included:

- I feel this workshop was very worthwhile to me and to all who participated. It will really be worthwhile if we can share and get to all teachers just a sampling of what we have gained from this.
- Most worthwhile project. I have gained enthusiasm which would have been much less without stimulus of this workshop.
- The workshop was a great experience. The materials and opportunity to learn were really good. However, the product I produced is not as complete as I had hoped it would be. But the activities I experimented on my classes with were very valuable.
- I came away more aware of what I don't know which is good. Also have many new approaches to presenting environmental studies. The time was well spent.

These comments suggest that the workshop was worthwhile for teachers. The workshop was able to increase teacher concern and motivation to continue self-exploration into environmental education resources. An important point of any workshop is that the participants develop an increased awareness of alternatives for problem solving. Project ESP was able to provide this problem-solving attitude on the part of teachers.

Environmental Concerns Matrix

The Environmental Concerns Matrix, see Figure 3, has been used in conjunction with the Texas Education Agency publication for environmental education. The matrix illustrates the integration of the personal concerns with environmental concerns and the educational functions of schooling. This model is critical to a clear understanding on the part of teachers of the concepts stressed in the teacher inservice presentation. The presentations were designed to provide teachers with skills in meeting students' personal concerns relative to the environmental needs. Within this context, information and resources were provided to offer direction in the solution of environmental concerns. The meetings with scientists, and state and national environmental specialists were an additional component of this phase. The teachers used these resources and the students' personal concerns in the development of the materials to fit the educational functions. The attached Appendix B is a copy of the materials developed for this purpose. Special note needs to be made to the practical nature of items developed and field tested by the teachers. Some preliminary research has revealed that students in the elementary grades participating in the organism interaction activity have had greater success in identifying the concept of food web interaction and organism interdependence than students without.

Concern Matrix for Environmental Education

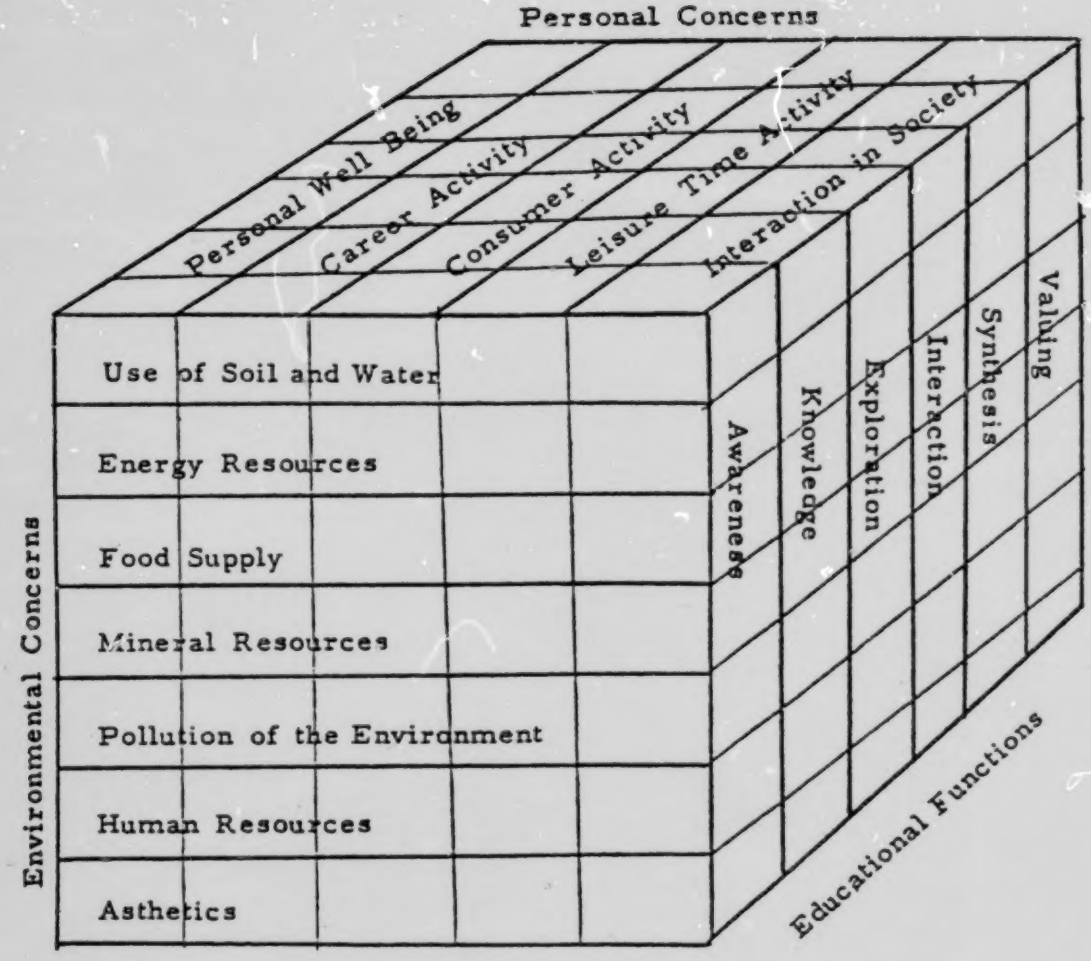

Figure 3

Rationale for ETC Product Development

Each of the teachers was asked to develop a comprehensive product for duplication and diffusion within the school system that meets a systemwide need in environmental education. The Needs Matrix, see Figure 4, was the foundation for this group project development. The rationale for the Environmental Needs Matrix is based on the fact that within the past two generations Texas' population has more than doubled and has dramatically changed from rural to urban. As a result of these changes, citizens have greatly altered their surroundings thus creating many environmental problems. Pollution of the environment, poor land development, and the struggle of plants and animals are but some of the pressing problems man has created.

Each citizen's attitude toward the management of the earth's resources will eventually determine the quality of life he can expect to have. Direct experiences with a wide spectrum of resources help understanding of resource use. These experiences are absolutely essential to shaping constructive attitudes. One can really learn about conservation of resources; positive attitudes toward the wise use of our leisure resources and avoidance of excessive pollution through direct involvement with management practices. Strategies must be developed to provide real experiences for school children in their daily educational activities. These environmental activities must be multidisciplinary. The activities must be structured around real objects and events in the community which youngsters encounter in their everyday lives. Conservation can then become a part of life rather than only a preparation for the "good life." Every facet of human concern ranging from personal health to recreation to community service must be the basis for designing educational experiences for children.

This rationale served teachers in the development of instructional guides, resources, units and self-paced visual instructional units. These resources are

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IN SATISFYING THEIR BASIC NEEDS People interact with their environment. In their everyday living people use resources and produce waste by-products which affect their health.

SOLID WASTE	SOUND (NOISE)	RADIATION	AIR	WATER	HEAT	CHEMICAL

HUMAN SURVIVAL

People are responsible for managing their interaction with the environment.

ENVIRONMENT	PEOPLE	COOPERATIVE ACTION	CONSUMERISM
DEFINITION	IMPORTANCE OF PEOPLE	RESPONSIBILITY	PRODUCT SAFETY (TOYS)
POSITIVE VS. NEGATIVE	PEOPLE POWER	POWER OF COOPERATION	POWER OF CONSUMER
EFFECT UPON PEOPLE	PSYCHOLOGICAL IMPACT	EFFECT OF COOPERATION COMMUNITY AGENCIES	EFFECT OF QUALITY CONTROL (FOOD-MED)
AESTHETIC SATISFACTION	APATHY FATALISM HELPLESSNESS	PROBLEM SOLVING	LEGAL ACTION
PUBLIC PROPERTIES	CULTURAL ARTS AND ENVIRONMENT	INTERNATIONAL VS ISOLATIONISM	LAWS - AGENCIES
VANDALISM	POSITIVE ATTITUDES	ENVIRONMENTAL EVALUATION	CONSUMER EVALUATION CRITERIA

HUMAN MOTIVATION

People must be educated to believe that their environment and health are in jeopardy.

RESOURCES LIFE STYLES TECHNOLOGY	HEALTH VS DISEASE	RESOURCES USE AND MISUSE	CONSERVATION OF RESOURCES	CRITICAL SEARCH BALANCE OF RESOURCES	ALTERNATIVES

Through cooperative planning and action PEOPLE CAN meet basic needs while PRESERVING THE QUALITY OF LIFE.

available via the local schools' delivery system to interested teachers. The five videotape programs available on the telecomputer grid system describe these products and the activities booklet in Appendix B. The videotape format includes an introduction by the Project ESP Facilitator stressing the multidisciplinary approach of the activities guide. The developer of the resource materials then explained the goals and nature of their product.

Dissemination Plan for Product

The dissemination of these resources began in May, 1977, when the booklet, Activities in Environmental Education (Appendix B), was sent to all of the participants in the core workshops. Each of the four service centers were given 20 copies for inclusion in their diffusion network. Forty-four interested persons who had supplied resources and information during the past year to the project were given copies of each of the products developed by the teacher groups and the local school system diffusion network. The ERIC Clearinghouse for Science, Mathematics, and Environmental Education has accepted the document, Activities in Environmental Education, for inclusion in their national network of resources (see Appendix C). This document will be microfilmed and placed in subscribing institutions nationwide.

Criteria for Effective Environmental Inservice

Trying to determine the critical components of an inservice presentation for teachers in environmental education, the project developed a Q-sort instrument of goal statements. In compliance with the accepted methodology of such instruments, there was an odd number of 17 statements. These statements were provided to a panel to ten experts to rank into five categories. The five categories began with the directions to place two goals in pocket A "that you think are most important for a teacher to accomplish in an environmental

education inservice." The second pocket B was to contain the four most important goals from the 15 remaining goal statements. Five goals were to be placed in pocket C and so on with the final two goals to be placed in pocket E that represent the goals least desirable for teachers in an environmental education inservice. The statements were designed to product the normal distribution requested by the data methodology. The complete rankings follow as Figure 5. The highest ranking goal was for teachers to develop an understanding of the interdependence of living things. Second was that teachers need to be able to identify factors that contribute to the deterioration of the natural environment. Third was that teachers should develop a wide range of communication skills to assist other teachers in integrating environmental concepts in their teaching. These were the goals that the project had tried to provide for teaching during the intensive inservice. The 24 teachers involved in the inservice were asked to rank the same statements as the experts. The data analysis was Analysis of Variance one-way design between experts and teachers. Statistical tables are in Figure 6. The difference between the teachers and experts was not significant. This probability figure of .8949 indicates that the two groups were in agreement as to what the goals need to be and there is no difference in the groups. This was the hypothesis of the project that teachers and experts would agree with the goals of the project in providing inservice content for teachers.

Cognitive Student Response

To determine the cognitive response of students to the environmental education inservice, a pre- and posttest (see Appendix D) was administered to students enrolled in secondary classes of teachers participating in Project ESP. The data analysis includes an item response frequence distribution of the posttest, see Figure 7, and an item response frequence of the pretest

Figure 5

Means of Q-Sort by Experts of Goals
of Environmental
Education Inservice

Rank/order	Goal	Mean
1	Teachers should develop understanding of the interdependence of living things.	1.628
2	Teachers should be able to identify factors that contribute to the deterioration of natural environment.	1.75
3	Teachers should develop a wide range of communication skills to assist other teachers in integrating environmental concepts in their teaching.	1.875
4	Teachers should develop a confidence for guiding children in the outdoor environment.	2.0
5	Teachers should develop students in aesthetic appreciation of the environment.	2.125
6	Teachers should promote students to consider the impact of human habits on the environment including littering and smoking.	2.25
7	Teachers should promote the development of student use in a natural area.	2.5
8	Teachers should develop a cognitive understanding of the energy resource matrix.	3.25
9	Teachers should develop a strong feeling about the delicate balance in the gene pool and the danger of the loss of any species.	3.375
9	Teachers should develop an awareness of the political system.	3.375
9	Teachers should support environmental laws for the protection of wildlife.	3.375
12	Teachers should be able to conduct measurements of environmental quality including air and water sampling.	3.5
12	Teachers should develop respect for the industry in their effort to meet the material and technical demands of society.	3.5

Figure 5 (continued)

14	Teachers should develop competencies in construction of manipulatives to determine environmental conditions including wind, speed, and gradient.	3.625
14	Teachers should develop a proper environment by refusing to destroy the natural environment.	3.625
16	Teachers should be able to identify cultures of three common bacteria found in sewage polluted water.	5.25
17	Teachers should develop a high level of cognitive understanding of the ozone layer deterioration.	5.375

Figure 5 (continued)

Means of Q-Sort by Teachers of Goals
of Environmental
Education Inservice

Rank/order	Goal	Mean
1	Teachers should develop understanding of the interdependence of living things.	1.83
2	Teachers should develop a confidence for guiding children in the outdoor environment.	2.24
2	Teachers should develop students in aesthetic appreciation of the environment.	2.24
4	Teachers should promote students to consider the impact of human habits on the environment including littering and smoking.	2.25
5	Teachers should develop a wide range of communication skills to assist other teachers in integrating environmental concepts in their teaching.	2.28
6	Teachers should promote the development of student use in a natural area.	2.29
7	Teachers should be able to identify factors that contribute to the deterioration of natural environment.	2.41
8	Teachers should develop an awareness of the political system.	2.42
9	Teachers should support environmental laws for the protection of wildlife.	2.63
10	Teachers should develop a proper environment by refusing to destroy the natural environment.	2.82
11	Teachers should develop a strong feeling about the delicate balance in the gene pool and the danger of the loss of any species.	3.18
12	Teachers should develop a cognitive understanding of the energy resource matrix.	3.59
12	Teachers should develop respect for the industry in their effort to meet the material and technical demands of society.	3.59
14	Teachers should be able to conduct measurements of environmental quality including air and water sampling.	3.69

Figure 5 (continued)

Rank/order	Goal	Mean
15	Teachers should develop a high level of cognitive understanding of the ozone layer deterioration.	4.00
16	Teachers should be able to identify cultures of three common bacteria found in sewage polluted water.	4.29
17	Teachers should develop competencies in construction of manipulatives to determine environmental conditions including wind, speed, and gradient.	4.35

Q SORT RANKINGS EXPERTS VS. TEACHERS - ESP 1977 ENVIRONMENTAL CONCEPTS

NUMBER OF GROUPS..... 2
NUMBER OF VARIABLES..... 1
END OF GROUP INDICATOR.. 9
DATA INPUT DEVICE..... 5

TEST(S) TO BE USED:
FISHER'S T TEST.

BLANK OR ZERO DATA IGNORED.

DATA FORMAT = (1F3.2)

GROUP	VARIABLE	MEAN	STANDARD DEVIATION	NUMBER OF OBSERVATIONS
1	1	2.94706	0.81419	17
2	1	2.98765	0.95770	17
TOTAL	1	2.96735	0.87552	34

ANALYSIS OF VARIANCE

SOURCE	SUM SQUARES	DEGREES OF FREEDOM	VARIANCE ESTIMATE	F RATIO	P	BARTLETT'S TEST CHI SQUARE	P
BETWEEN	0.0140	1.	0.0140	0.0177	0.8949	0.4071	0.8158
WITHIN	25.2817	32.	0.7901				
TOTAL	25.2957	33.					

30

29

Figure 7

C007601990

ITEM-TEST-HOMOGENEITY ANALYSIS

ENVIRONMENTAL EDUCATION POST TEST

ITEM RESPONSE FREQUENCY DISTRIBUTION

ITEM	ITEM MEAN	ITEM SD	BLANKS	RESPONSE VALUES 0	1	2	3	4	5	BLANKS	0	1	2	3	4	5
1	0.503	0.502	0.	0.	38.	83.*	26.	18.	0.	0.0	0.0	23.0	50.3	15.8	10.9	0.0
2	0.152	0.360	0.	0.	130.	7.	25.*	3.	0.	0.0	0.0	78.8	4.2	15.2	1.8	0.0
3	0.461	0.500	0.	0.	76.*	49.	39.	1.	0.	0.0	0.0	46.1	29.7	23.6	0.6	0.0
4	0.339	0.475	0.	0.	17.	53.	37.	56.*	2.	0.0	0.0	10.3	32.1	22.4	33.9	1.2
5	0.255	0.437	0.	1.	47.	62.	42.*	12.	1.	0.0	0.6	28.5	37.6	25.5	7.3	0.6
6	0.158	0.365	0.	0.	46.	39.	52.	26.*	2.	0.0	0.0	27.9	23.6	31.5	15.8	1.2
7	0.612	0.489	0.	0.	3.	9.	46.	101.*	6.	0.0	0.0	1.8	5.5	27.9	61.2	3.6
8	0.479	0.501	0.	0.	40.	79.*	31.	15.	0.	0.0	0.0	24.2	47.9	18.8	9.1	0.0
9	0.145	0.354	0.	0.	50.	85.	24.*	4.	2.	0.0	0.0	30.3	51.5	14.5	2.4	1.2
10	0.327	0.471	0.	0.	13.	61.	33.	54.*	4.	0.0	0.0	7.9	37.0	20.0	32.7	2.4
11	0.279	0.450	0.	0.	28.	53.	35.	46.*	3.	0.0	0.0	17.0	32.1	21.2	27.9	1.8
12	0.612	0.489	0.	0.	22.	101.*	12.	29.	1.	0.0	0.0	13.3	61.2	7.3	17.6	0.6
13	0.655	0.477	0.	0.	108.*	27.	20.	10.	0.	0.0	0.0	65.5	16.4	12.1	6.1	0.0
14	0.552	0.499	0.	0.	91.*	59.	11.	2.	2.	0.0	0.0	55.2	35.8	6.7	1.2	1.2
15	0.091	0.288	0.	1.	15.*	35.	19.	91.	4.	0.0	0.6	9.1	21.2	11.5	55.2	2.4
16	0.764	0.426	0.	1.	126.*	14.	9.	15.	0.	0.0	0.6	76.4	8.5	5.5	9.1	0.0
17	0.297	0.458	0.	1.	50.	33.	26.	49.*	6.	0.0	0.6	30.3	20.0	15.8	29.7	3.6
18	0.515	0.501	0.	0.	85.*	24.	13.	41.	2.	0.0	0.0	51.5	14.5	7.9	24.8	1.2
19	0.412	0.494	0.	2.	21.	68.*	60.	13.	1.	0.0	1.2	12.7	41.2	36.4	7.9	0.6
20	0.242	0.430	0.	0.	40.*	108.	5.	12.	0.	0.0	0.0	24.2	65.5	3.0	7.3	0.0
21	0.521	0.501	0.	0.	26.	86.*	34.	19.	0.	0.0	0.0	15.8	52.1	20.6	11.5	0.0
22	0.709	0.456	0.	0.	117.*	20.	19.	9.	0.	0.0	0.0	70.9	12.1	11.5	5.5	0.0
23	0.642	0.481	0.	0.	106.*	36.	18.	5.	0.	0.0	0.0	64.2	21.8	10.9	3.0	0.0
24	0.661	0.475	0.	0.	109.*	23.	8.	23.	2.	0.0	0.0	66.1	13.9	4.8	13.9	1.2
25	0.715	0.453	0.	0.	118.*	23.	12.	11.	1.	0.0	0.0	71.5	13.9	7.3	6.7	0.6
26	0.648	0.479	0.	0.	107.*	22.	24.	11.	1.	0.0	0.0	64.8	13.3	14.5	6.7	0.6
27	0.679	0.468	0.	0.	112.*	26.	13.	13.	1.	0.0	0.0	67.9	15.8	7.9	7.9	0.6
28	0.691	0.464	0.	0.	114.*	29.	13.	9.	0.	0.0	0.0	69.1	17.6	7.9	5.5	0.0
29	0.758	0.430	0.	2.	125.*	19.	8.	10.	1.	0.0	1.2	75.8	11.5	4.8	6.1	0.6
30	0.339	0.475	0.	1.	56.*	32.	63.	12.	1.	0.0	0.6	33.9	19.4	38.2	7.3	0.6
31	0.503	0.502	0.	2.	83.*	21.	54.	5.	0.	0.0	1.2	50.3	12.7	32.7	3.0	0.0
32	0.206	0.406	0.	3.	34.*	8.	30.	90.	0.	0.0	1.8	20.6	4.8	18.2	54.5	0.0
33	0.345	0.477	0.	1.	13.	57.*	56.	38.	0.	0.0	0.6	7.9	34.5	33.9	23.0	0.0
34	0.394	0.490	0.	2.	65.*	49.	14.	35.	0.	0.0	1.2	39.4	29.7	8.5	21.2	0.0
35	0.170	0.377	0.	1.	9.	28.*	110.	17.	0.	0.0	0.6	5.5	17.0	66.7	10.3	0.0
36	0.224	0.418	0.	0.	85.	37.*	29.	14.	0.	0.0	0.0	51.5	22.4	17.6	8.5	0.0
37	0.285	0.453	0.	0.	60.	47.*	38.	20.	0.	0.0	0.0	36.4	28.5	23.0	12.1	0.0
38	0.267	0.444	0.	0.	29.	44.*	68.	21.	3.	0.0	0.0	17.6	26.7	41.2	12.7	1.8
39	0.370	0.484	0.	6.	61.*	52.	26.	19.	1.	0.0	3.6	37.0	31.5	15.8	11.5	0.6
40	0.527	0.501	0.	3.	87.*	44.	19.	10.	2.	0.0	1.8	52.7	26.7	11.5	6.1	1.2

NO TEST FOR BLANKS.

ASTERISK(*) INDICATES KEYED RESPONSE.

including the items, see Figure 8. An analysis by groups of the test including a difficulty index was performed on the posttest as seen in Appendix E. The test has two major components. Items 1-21 inclusive are relative to environmental information and concepts. Students should have been provided information relative to or given suggestions as to the availability of information to answer similar questions. The second component in items 22-40 inclusive are opinions of students. The test instrument was designed and field tested by the ERIC Clearinghouse for Science, Mathematics, and Environmental Education at the Ohio State University, in Columbus, Ohio. The test has been field tested for three years in the United States and Australia by ERIC. Some of the questions were modified to meet local needs. The number of students taking the posttest was 162. The number of students taking the pretest was 132. The students were all in class, in the participating school district, enrolled in high schools with over 1,500 students.

In considering the items some provide outstanding changes in student learning and others indicate the change is not as great as would have been hypothesized. In item two the percentage of students aware of geothermal sources for energy production for large scale use increased from 3 percent to 15 percent on the posttest. The students learned that nuclear power wastes are stored in concentrated solid form as seen in the increase from 19 to 39 percent. Question 10 concerning the degree which industry can clean up water pollution indicated an increase tolerance of realistic constraints by a drop in the percent expectation of 100 percent reduction of water pollution and an increase in those suggesting an 85 percent reduction of water pollution by industry. Item 13 indicated that 65 percent felt there is an increase in nonmedical use of drugs, this is up from the pretest estimate by students. Item 19 indicated increased knowledge that the 85 decibel level is the lowest "safe" sound level.

Figure 8 G007601990
Inventory A

Pre Instrument May, 1977
Scores are Percentages N=132

Directions

Read each item and mark the answer which you believe provides the best answer to the question or the statement on the answer sheet provided. (If you are not provided with an answer sheet, mark your answer on the inventory in the space provided.)

1. Land use in the U.S. is shifting from

10 (a) urban to rural
61 (b) rural to suburban
28 (c) suburban to urban
1 (d) suburban to rural

2. Research and technical break-throughs have demonstrated that energy can be obtained on a large scale from which of the following sources?

79 (a) solar energy
6 (b) tidal flow
3 (c) geothermal sources
10 (d) wind power

3. The U.S. population is growing at a rate which is

28 (a) less than that of most of the rest of the world
40 (b) at about the same rate as that of most of the rest of the world
38 (c) at a rate more rapid than that of most of the rest of the world

4. Wastes from nuclear power plants which are high in radioactivity are currently

16 (a) lost into the air
42 (b) discharged into water sources such as rivers and lakes
24 (c) concentrated and stored in liquid form
19 (d) concentrated and stored in solid form

5. Most of the radiation to which the average American is exposed is due to

38 (a) Solar sources
37 (b) TV sets and luminous wrist watches
21 (c) medical sources (X-rays, etc.)
3 (d) Atomic bombs and nuclear power plants.

6. Once DDT has been spread to kill pests it

28 (a) remains active for a few weeks only

23 (b) remains active for one or two years

37 (c) remains active for many years

10 (d) remains active for ever

7. Death in the United States due to lung cancer is greatest in

2 (a) rural areas
4 (b) cities of less than 250,000 people
33 (c) cities of 250,000 to 1,000,000
59 (d) cities over 1,000,000

8. At today's rate of consumption known reserves of zinc, lead, tin, petroleum, and copper will be depleted in

25 (a) 10 years
49 (b) 50 years
20 (c) 100 years
4 (d) 200 years

9. Industry is responsible for what percent of the water pollution?

37 (a) 95%
42 (b) 65%
18 (c) 45%
2 (d) 25%

10. The Environmental Protection Agency estimates that industry can currently remove what percent of pollution discharged into water

11 (a) 100%
27 (b) 85%
19 (c) 65%
41 (d) 50%

11. North Americans are removing fresh water from underground sources

24 (a) not accurately known
37 (b) less than the repacement rate
14 (c) about equal to replacement rate
24 (d) more than the replacement rate

12. The major cause of death in the 18-24 age group is

6 (a) suicide
29 (b) auto accidents
18 (c) sickness and disease
46 (d) drugs

13. The non-medical use of drugs in the U.S. is

49 (a) increasing
27 (b) about constant
18 (c) decreasing but receiving more publicity
8 (d) decreasing

14. The greatest amount of air pollution in developed countries comes from

61 (a) cars, buses, trains, planes etc
29 (b) industry
7 (c) burning solid wastes
2 (d) homes

15. The major air pollutant discharged into the air by weight is

7 (a) nitrogen oxide
17 (b) sulfur oxide
3 (c) particulates
73 (d) carbon monoxide

16. Where do you believe we have the areas of worst pollution and ugliest construction?

77 (a) cities
15 (b) suburbs
3 (c) villages
3 (d) rural areas

17. Non-medicinal use of drugs would decline if we

35 (a) passed and enforced stricter laws
14 (b) made the use of drugs legal
16 (c) enforced present laws
35 (d) none of the above

18. Injuries caused by accidents are the leading cause of death in which of the following age groups?

40 (a) 1 through 30
15 (b) 30 through 60
3 (c) over 60 years
40 (d) all of these

19. Research data indicate that physiological hearing damage begins at an exposure to

17 (a) 40 declibels
34 (b) 85 decibels
39 (c) 120 decibels
10 (d) 210 decibels

20. Most of the phosphates which reach the oceans come from

30 (a) local cities
61 (b) industrial sources
5 (c) farms
3 (d) boats

21. An inversion can be harmful because it

14 (a) puts more carbon dioxide into the air
35 (b) keeps pollution near the ground
26 (c) cuts down on horizontal air flow
23 (d) produces pollutant particles

Directions

Read each item and mark the answer which you believe provides the best answer to the question or the statement on the answer sheet provided. (If you are not provided with an answer sheet, mark your answer on the inventory in the space provided.)

22. Living things are interdependent with one another and with their environment.
51 Agree 23 Neutral 15 Disagree 11 No Opinion

23. Man has affected environmental processes in a negative way.
43 Agree 25 Neutral 16 Disagree 15 No Opinion

24. Increased population mobility is changing the nature of demands upon some resources.
70 Agree 10 Neutral 14 Disagree 8 No Opinion

25. Outdoor recreation is an increasingly important part of our culture and our economy.
46 Agree 26 Neutral 20 Disagree 8 No Opinion

26. Choices between human needs (essentials) and human wants or desires (nonessentials) must be considered if we are to improve our quality of life.
54 Agree 18 Neutral 8 Disagree 19 No Opinion

27. In any environment, one component like water, air, or food may limit the type of life which can survive.
61 Agree 15 Neutral 10 Disagree 14 No Opinion

28. Organisms and environments are in constant change.
60 Agree 20 Neutral 11 Disagree 8 No Opinion

29. Man has responsibility to develop an appreciation of and respect for the rights of others.
60 Agree 13 Neutral 11 Disagree 15 No Opinion

30. Only strong governmental controls will reduce pollution problems.
32 Agree 14 Neutral 43 Disagree 11 No Opinion

31. Each parent is currently allowed to deduct several hundred dollars from their taxable income for each child in their family. I would vote

54 (1) increase the tax exemption (allowance) per child
19 (2) decrease the tax exemption (allowance) per child
27 (3) leave the tax exemption (allowance) per child as it is

32. Which of the following problems is most serious in your community?

31 (1) air pollution
16 (2) water pollution
27 (3) solid waste disposal
27 (4) land use

33. Which of the following problems is most serious in your community?

15 (1) pollution problems
26 (2) land use
29 (3) crime
29 (4) traffic accidents

34. Which of the following problems is most serious in your community?

32 (1) pollution problems and land use
20 (2) crime
20 (3) health problems
28 (4) traffic accidents

35. An individual has too much power in determining the way he lives.
13 Agree 23 Neutral 41 Disagree 22 No Opinion

36. Farmers are generally more concerned about environmental problems than are people who live in the suburbs.
34 Agree 14 Neutral 8 Disagree 5 No Opinion

37. People who live in the suburbs generally are more concerned about environmental problems than are people who live in the inner city.
16 Agree 42 Neutral 28 Disagree 14 No Opinion

38. It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future.
24 Agree 26 Neutral 28 Disagree 23 No Opinion

39. Industries should not be allowed to contribute to pollution - either through production or with the end product.
40 Agree 32 Neutral 12 Disagree 17 No Opinion

40. Controls should be placed on industry which will protect the environment even if it means things will cost more.
34 Agree 37 Neutral 9 Disagree 20 No Opinion

The opinions expressed in items 22-40 indicate an increased awareness of the complex interrelationships involved in environmental decisions. The increase of 20 percent in the number of students feeling that living things are interdependent provides support that the objectives of the teacher inservice were carried over in the learning of students. Increases were seen in the percent of students feeling that:

A. Man has affected environmental process in a negative way.

B. Outdoor recreation is an increasing important part of our culture and economy.

C. Choices between human needs (essential) and human wants or desires (nonessential) must be considered if we are to improve our quality of life.

D. In any environment, one component like water, air or food may limit the type of life which can survive.

E. Organisms and environment are in constant change.

F. Man has the responsibility to develop and appreciation of the respect for the rights of others.

G. Land use is the most serious problem in the community.

H. Farmers are more concerned about environmental problems than are people who live in the suburbs.

I. Industries should not be allowed to contribute to pollution.

J. Controls should be placed on industry which will protect the environment even if it means things will cost more.

There was a significant increase in the number of students disagreeing with the statement that "It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future." This seems to indicate students are willing to have some freedoms

limited if the quality of life is maintained. Of the increased opinions indicated the students' attitudes as seen here have been increased to incorporate the concept of interdependence of all aspects of the economy and the quality of life. The actions of an individual affect the quality of life of others and the burden to restore a necessary quality rests on all persons in the society.

BENEFITS OF PROJECT ESP DERIVED FROM THE ACTIONS OF 1976-1977

During 1977-78 Environmental Studies Program (Project ESP) has been able to provide inservice training to teachers in the Richardson Independent School District K-12. The number of persons attending inservice workshops, summer inservice training, core multiplier training, and building inservice exceeds four hundred professionals. The project has been able to provide direct service to over 2000 students through direction at the environmental studies center and building programs presented by the project facilitator. The multiplier effect has been realized by the production of inservice programs by the core team to 15 different schools and their faculties. The school district has provided time and space for supplemental inservice programs by the Environmental Protection Agency, Texas Governor's Energy Advisory Council, and The Texas Power and Light Company. The Richardson Chamber of Commerce Committee on environmental affairs has participated in a presentation by the environmental facilitator and attended an on-site presentation of the environmental studies center.

The professional community has participated in dissemination of information about the products of Project ESP through an invitation to the project facilitator to be a speaker at a meeting of the Metroplex Area Science Educators' meeting. The result of this meeting was a request from Fort Worth ISD, Garland ISD, Irving ISD, and Dallas ISD to use the facilitator in the providing of inservice for secondary teachers and program development.

Inservice programs have been presented at Seqouia Environmental School in the Dallas ISD with the teachers and with the environmental curriculum development staff and with the living materials center staff. The Science Teacher Association of Texas invited the facilitator to display materials to Texas educators

at their state meeting in October, 1976. The Journal of Science Teaching in Texas has requested and received information about the project for dissemination via their publication to all Texas educators. The National Science Teachers Association provided space and a time for presentation of the accomplishments and materials of Project ESP to their national meeting in Cincinnati, March 27, 1977. The Richardson Secondary Consultants Association has invited the facilitator to their meeting and disseminated information about the project. The Richardson Team consultants have had the facilitator to their weekly meeting to participate in the project.

The project facilitator has been able to contact the following school districts to provide inservice and consultant and/or technical service in the development of teacher inservice and a multidisciplinary program of environmental curricular materials: Weatherford, Fort Worth, Plano, Garland, Longview, Daingerfield, Irving, Dallas, and Richardson. These contacts have been instrumental in directing the Region 10 Education Service Center to send two representatives to a workshop in environmental curricular materials held in Austin, Texas. Members of each of the four service centers in the Consortium have sent staff persons to this workshop to enlarge the service center's role in providing assistance to schools in the development and infusion of environmental education concepts in teaching.

Project ESP sponsored a presentation by Project Environmental Education Community Opportunity for Stewardship (ECOS). The intention of the workshop was to assist schools in the development of K-12 curricular resources that reflect the multidisciplinary approach to environmental education.

The workshop was organized where each school district was required to send a building principal and a teacher or teachers to the three-day workshop to develop the curricular resources that infuse environmental stewardship. The

Richardson ISD was able to identify principals and teachers from the attendance zones of the high schools to assure a smooth assimilation of environmental education curricular materials into the classroom. The hope was that six principal and teacher teams would be in attendance, but in the end 15 teams were able to attend. The district committed additional monies above the original project commitment for providing inservice to be assured the attendance of their teams. The Plano Independent School District sent personnel from each grade level to form the nucleus of grade level teams that met with the environmental facilitator for 16 hours of additional training and development in secondary curricular resources. The Garland ISD agreed to participate and sent five persons and a supervisor to form the nucleus of their curriculum infusion team. There is one regional education service center outside of the consortium working on environmental education materials for the state and they sent three consultants to participate in the ECOS workshop. The principal of the environmental school of the Texas Youth Council attended the workshop in order to develop an infusion module for their curricular component.

The final efforts of Project ESP were concentrated on dissemination of the final product from the teacher inservice workshops and the completion of the videotapes for use in September, 1977. The project facilitator has been able to contact many of the projects and concerned persons in the area to stimulate the formulation of a Texas Association for Environmental Education. A direct result of the National Association for Environmental Education meeting in Estes Park, Colorado was the Texas Association for Environmental Education. The consortium has provided assistance to this growing group of concerned Texas educators in the assembly of a mailing list of Project ESP inservice participants and dissemination to members of TAEE of the accomplishments of Project ESP. The association is planning a conference for the fall of 1977. During

1976-77 the concern for a strong program of environmental education in Texas has grown as a result of the national concern for limited resources. Project ESP has been able to exert a great amount of leadership in this area because the facilitator was a full-time educator in the state with a sole concern for environmental education. This growth has continued and seems to grow as more teachers are aware of the resources in environmental education.

The videotape component has been completed and includes nine 20-minute programs for airing in September, 1977. The programs have two different formats. Four programs are adaptations from the Shenandoah Valley Natural History Park programs in environmental education. These are specific to curricular areas and are various narrations on a sequential visual presentation of environmental situations. The programs are for use by teachers in the secondary schools and provide suggestions to teachers in what they may like to do to incorporate environmental education in their classes. The second portion of videotapes is a series of five 22-minute programs developed and filmed at the Richardson Independent School District television studio. The purpose of the programs is to disseminate to the teachers the products developed by teacher teams during the ten days of inservice curriculum development. The video format is a brief introduction specifying the goal of the videotape and where the product is housed. The product to be discussed can be secured for inspection by a teacher followed by a description and illustration of the product developed. The five videotapes were developed as appropriate to grade level and curriculum concentration. There has been some interest by the Plano Independent School District to use these videotapes as a model for programming which they hope to develop and provide for teachers in the future. These videotapes assure that the dissemination of Project ESP has been institutionalized beyond the original scope of the project. The participating district maintains the videotapes and

schedules them for broadcast, and coordinates the dissemination of the materials to teachers and other interested persons.

Currently, programs are planned and materials made ready for two intensive inservice workshops of three days, one in Plano ISD and one with the Richardson ISD. These will utilize the services of Project ESP personnel and members of available environmental resource specialists. Inservice programs have been planned and tentative print orders made for handouts to participating teachers in the four service centers.

The Region XI Education Service Center in Fort Worth has planned for the project facilitator to provide inservice in a specialist conference in August, 1977. The Weatherford ISD has made the tentative plans necessary for the facilitator to implement awareness on the part of the local school in August, 1977.

The Dallas Museum Gardens has contacted the facilitator and arranged for the planning and implementation of a docent training session utilizing resource specialists suggested by the facilitator. The plan is to provide the volunteer guide a meaningful program for infusing environmental concepts in their daily lives as well as the information and spirit they impart in working with children. This contact tends to broaden the impact of Project ESP beyond the schools and into the public.

The project in tandem with the Texas Education Agency, Division of Vocational Education and the Texas Energy Advisory Board was able to provide resources and copies of the Texas Energy Handbook to 200 secondary teachers participating in Coordinated Vocational Academic Education classes throughout Texas during a statewide workshop on June 29, 1977.

The project staff has been able to assist the Ranger Rick magazine by providing suggestions for the teacher guide and articles for the magazine. As

part of the National Wildlife Federation program the Ranger Rick contributions increases the quality of Project ESP's impact on environmental education nationwide.

In response to a request by the National Science Foundation Program OBIS, Outdoor Biological Instructional Strategies, the facilitator has provided suggestions for future environmental activities. The OBIS program is currently beginning programs for the visually impaired and migrant students. Project ESP has been able to provide teachers to assist in the evaluation and field testing of these programs and offer suggestions for future activities.

The facilitator was invited to Washington, D.C. to assist the National Science Foundation in the evaluation of proposals classified as environmental science. This increased the national exposure of the project and created interest on the part of educators in New York, Ohio, and Washington state for the publication activities in environmental education.

The contribution of Project ESP to the growth and development of environmental education in Texas has been measurable and in excess of the projected goals.

North Texas State University sponsored a conference with the Texas Electric Service group in energy and the environment that requested the participation of the facilitator. The facilitator was able to distribute copies of the activities in environmental education guide, the resource booklet, and other free literature.

This awareness and commitment to involvement by such a wide variety of schools and institutions to the infusion of multidisciplinary environmental education concepts in the curriculum is in part a result of Project ESP's ability to provide services in areas where the need exists. A survey of 22 school districts in the consortium area as to the critical science needs

pointed up the need for information in environmental science continues to exist. As teachers and students continue to increase their concern and interest in developing a comprehensive and specific self-growth plan of the environmental interface, Project ESP's resources will be available. Local schools have committed increased local funds to the development of environmental education as a result of the effect of Project ESP.

Summary

Project ESP has been able to provide trained teacher leaders to meet the needs of concerned environmental education teachers. The environmental training conference model has been field tested and proven effective in providing information to educators. The products of the Teacher Leaders (TLs) are adapted to meet critical local needs in environmental concepts. The awareness of educators in the 49 counties served by the consortium has been raised toward promoting a multidisciplinary approach to environmental education. Educators in Texas and in specific cases throughout the nation have gained direct benefit from the work of the facilitator and the project staff. Project ESP's involvment with Dallas County Museum demonstrates by action the intent of H.E.W. Secretary Califano's remarks that "education is not limited to schools." The benefits of the Project ESP seem wide ranging. The data on students' and teachers' attitudes could be used in the future to help determine local needs.

Appendix A

Appendix A
Project ESP Core Workshop
Final Evaluation
March 15, 1977

EVALUATION CRITERIA

1.	The organization of the workshop was:	Poor 1	2	3	4	5	6	Excellent 7	cc 1
2.	The objectives of the workshop were:	Vague 1	2	3	4	5	6	Clearly Evident 7	cc 2
3.	The work of the consultant(s) was:	Poor 1	2	3	4	5	6	Excellent 7	cc 3
4.	The ideas and activities presented were:	Dull 1	2	3	4	5	6	Very Interesting 7	cc 4
5.	The scope (coverage) was:	Inadequate 1	2	3	4	5	6	Very Adequate 7	cc 5
6.	My attendance at this workshop should prove:	No Benefit 1	2	3	4	5	6	Very Beneficial 7	cc 6
7.	Overall, I consider this workshop	Poor 1	2	3	4	5	6	Excellent 7	cc 7
8.	Do you feel a need for additional information about the topic?	1. Yes					2. No		cc 8

Pre	EEO 9-10	MYSELF 11-12	TEA 13-14	SCHOOL 15-16	ENVIR 17-18	OUT 19-20	POLL 21-22
Post	23-24	25-26	27-28	29-30	31-32	33-34	35-36

Please rank the following activities as to how they helped you in developing material, understanding environmental education, or getting ideas for teaching.

	Not Needed				Very Benefical	
Learning one another's names	1	2	3	4	5	(37)
Dr. Stanford's talk	1	2	3	4	5	(38)
The Addison Wesley Publisher (Essence)	1	2	3	4	5	(39)
The Learning Games: DNA, Blood Clue	1	2	3	4	5	(40)
Visit to environmental study center	1	2	3	4	5	(41)
Jim Stephen's Slide Story	1	2	3	4	5	(42)
Sharing OBIS activities	1	2	3	4	5	(43)
Publisher presentations	1	2	3	4	5	(44)
Ron Studdard's slide story	1	2	3	4	5	(45)
Laminating leaves	1	2	3	4	5	(46)
Time to travel to other places	1	2	3	4	5	(47)
Dallas Museum presentation	1	2	3	4	5	(48)
Developing study guides for the center	1	2	3	4	5	(49)
How to present on inservice	1	2	3	4	5	(50)

The strongest features of the workshop were:

The weaker features were:

Comments:

Appendix B

ENVIRONMENTAL STUDIES PROGRAM

ACTIVITIES IN ENVIRONMENTAL EDUCATION

EPD CONSORTIUM D

A C T I V I T I E S
I N
E N V I R O N M E N T A L E D U C A T I O N

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Dr. Billy N. Pope, Project Director
Mike Owens, Project Facilitator
Educational Personnel Development Consortium D

Acknowledgements

During 1976-77 Environmental Studies Program used the facilities of the Richardson Independent School District to conduct inservice for teachers and develop instructional strategies for use with students. The teachers participating in the development and validation of activities found in this guide were:

Berkner High School	Katherine Goodbar Cathy Miller
J. J. Pearce High School	Mary McBride
Richardson High School	Ginger Mayo
Lake Highland High School	Windy Windstead
Forest Meadow Junior High School	Richard Bass
Lake Highlands Junior High School	Vicki Keathley Lane Peters
Liberty Junior High School	Sally Fox
Northwood Junior High School	Yvonne Nickerson Jim Stephens
Richardson Junior High School	Ron Studdert Kathy Wohlgehagen
Richardson West Junior High School	Diane Stephens
Westwood Junior High School	Charlotte Klenk
James Bowie Elementary	Nancy McDaniel Roger Renfro
Dartmouth Elementary	Mary Baird
Greenwood Hills Elementary	Maxine Daniel
Mark Twain Elementary	Donnie Ickles
Spring Creek Elementary	Janice Clevenger Neal Frindell Bonnie Mitchell
Terrace Elementary	Jennie Vahrenkamp

Special thanks go to Mr. David Olson, the Secondary Science Consultant for the Richardson schools, and Mr. Gene Peer, leader of Team C Elementary Consultants for Richardson schools. It is only through the efforts of Gene and David that this project was able to meet and exceed its goals and objectives. Environmental education needs the dedicated leadership of administrative and support staff to be able to meet the educational needs of children of the future.

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Description
Project ESP Environmental Studies Program

Project ESP proposed to provide environmental education resources to teachers in the 49 Texas counties that make up Educational Personnel Development Consortium D. During the year 1976-77, the project involved the Richardson Independent School District in Dallas County, Texas, in the development of a model for school districts development of environmental education curricula and for involvment by the school faculty in environmental education concepts. The plan was to incorporate awareness on the part of a large audience and select the most interested persons to participate in the curriculum development phase. The curriculum developers are to act as multipliers providing inservice education in their buildings and within the local school systems as well as other schools in the consortium.

The local school district participated in the writing of the proposal and undertook the original awareness before the funding of the project. The awareness was a series of workshops led by the local science coordinator. The initial workshop was a three-day interaction held at the school's environmental study site and the administration building. The workshop was designed to provide teachers with skills and confidence in working in the environment. To provide these skills the resources of the State Water Quality Board, the State Parks and Wildlife Department, the local soil conservation office, and the State Forestry Service were secured. Each agency provided a consultant that conducted a half-day's activity divided between field work on site and inside work done at the administration building. The third day was a workshop held by an outside consultant in the use and design of the Outdoor Biological Instructional Strategies (OBIS) materials and a Texas product, the Harris County environmental guides, were displayed. The project facilitator assembled a packet of resource materials from state and federal agencies of over 60 items

that were given to the teachers. There was time for teachers to participate in development of bulletin boards and learning centers. The resources that were available were all free from state or federal sources. The participants were asked to volunteer to participate in the curriculum development phase of the project and 24 persons were identified. A subsequent inservice was held during the two days before school, where new teachers and others were informed of the curriculum development opportunities and given basic awareness of the need to incorporate environmental concepts in their teaching. Of a total of 30 volunteers, 24 were able to make the final commitment to assist in curriculum materials. The products of their work are the contents of this report.

The 24 participants were involved in ten days of inservice. The inservice days were separated by one or more weeks and lasted from September until March. Each inservice was designed to meet specific needs and included representatives of commercial materials, local museum curators, specialists in environmental science, and opportunities for field trips to environmental resource areas. The participants were placed in groups early in the inservice and given the task of designing instructional materials for use in their class. The materials were revised and field tested and presented for circulation within the district as a model environmental unit. The materials developed included slide stories on school environmental sites, learning centers, learning packets, and total mini courses of instructional materials. The products are by-and-large specific to local needs and not available for distribution. This guide is designed to disseminate the information from the project that has the greatest appeal and impact on environmental education.

The model used in Project ESP was most successful and is recommended for any one school district trying to infuse environmental stewardship in the curriculum. The concepts of limited natural resources, the interdependency

of all living and nonliving systems on the energy matrix, were illustrated by the participants. Environmental education linked with active use of the on-school site and a natural area set aside for students to observe the natural changes were the most successful. It is important if educators expect children to appreciate the dynamics of change to provide them a platform as observers of this change rather than the constant turmoil they experience as being in change. It is seldom in an urban school that a child attends grades K-6 at one school with one teacher in one room. Therefore, it is imperative that a "same" place be provided, such as an environmental study center where children are allowed to observe one place over the years and to note the natural changes. Environmental education continues to be a pressing concern for the public and the school in that the unborn society of tomorrow must live with the decisions of the dying generation of today.

TRIED & TRUE

Descriptions of Activities

Inside and Outside

Done By ESP Participants

Title: Bug 300 (an alternative to insect collections)
Used by Vicki Keathley | Lake Highlands Junior High School | Grade level 7-12
Spring 1976 | 3 classes | Indoor

Appropriate grade levels 7-12

Describe activity: The materials are used to make cages for live insects (construction is explained on the back). Adult insects such as crickets, grasshoppers, preying mantis and beetles are brought by the students and placed in cages (cages are labeled as to name and location caught). Students are responsible for feeding the insects and deciding when to let them go, etc. Another section of the zoo is labeled the "Baby" zoo. In these cages we had cocoons, pupas, and egg cases the students found (also caterpillars). They were watched over the weeks until they "hatched." The caterpillars had to be supplied with their particular food almost daily, so it is essential that the student bringing them in, know the type of plant source they were found on.

Material Used: Wire screen, coffee cans, wire, hacksaw or metal cutter or old stockings and 1/2 pt. or pt. milk cartons.

Difficulties: There may be some difficulty in finding space in your room for the cages, and a few minutes will be needed each day for the students to take care of the insects. Also some insects do not do well and will have to be released. Many days will be uneventful, but on that "Tuesday" the green caterpillars start spinning their cocoons or that "Friday" a moth emerges from a pupa it will all be worthwhile. The day I had 300 1/2 inch preying mantis' emerge was tremendous. Every child got to hold one and then let it go out of the window. You may want to do this strictly for showing the different types of metamorphosis and leave out the adult insects. But many, such as the preying mantis are very interesting to a child. (Hemiptera's are hard to keep for more than a day or so)

Construction of cages: You will need any size coffee can with the plastic lid. (I prefer the 1 pound) These will have to be cut in half (crosswise) with the hacksaw. Hint-this is not an easy job. I recommend students bring already cut cans from home. The rough edges of the can should be covered with tape or wax as they can really be sharp. The wire should be rolled into a 1 foot long cylinder, with a diameter the same as the diameter of the can (wire the screen together). Then place the top and bottom of the can on the ends of the cylinder and place upright. The insects are released into the cage through the plastic lid. An easier method for insect cages, is to cut 2 sides out of a 1/2 pt. or pt. milk carton and slip it into an old stocking. The stocking will be tight against the carton, so the insects stay in the carton.

Title: Mapping a Study Site
Used by Janice Clevenger | Spring Creek Elem. | OBIS I | Grade 6
Oct. 1 and 4, 1976 | 25 Students | Outdoor

Appropriate grade levels 4-9

Describe activity: This is designed to allow students to map major features of an outdoor site. We used a creek area across from the school. Students were divided into groups and were assigned different quadrants as suggested in the instructions. Color codes were established for different features found. Groups then compiled their facts and created 1 large map for general classroom use.

Materials Used: Meter stick, string remeasured to 10 m., data board, pencils, marking pens

Title: Mural on Pollution
Used by Cathy Miller | Berkner High School | Grade-High School
Jan. 19-Feb. 1 | 163 Students | Indoor

Appropriate grade levels K-12

Describe activity: Told students to creatively portray pollution on the mural by pictures or letters.

Materials Used: Marks-a-lots, butcher paper

Title: Community Activity Card
Used by Cathy Miller | Berkner High School | Essence II
Jan. 19-22 | 35 Students | Indoor

Appropriate grade levels 7-12

Describe activity: Read card to Students: Make different sounds in different situations-Record your reactions.

Title: Genetics Mystery Game
Used by Lane Peters | Lake Highlands Junior High School | Grade 7
Dec. 15, 1976 | 90 Students | Indoor

Appropriate grade levels 7

Describe activity: Kids are in groups and together decide the genotype of the people and decide who is Mr. Jones' real child.

Material Used: Heredity Mystery

Title: OBIS Invent An Animal-Adaptation
Used by Donnie Ickles | Mark Twain Elementary | Grade Level 6th
Nov. 29/ Dec. 3, 1976 | 23 Students | OBIS I | Indoor and Outdoor

Appropriate grade levels 4-7

Describe activity: Each student was to invent an animal and camouflage it. They had reviewed a National Geographic filmstrip on animals and their habitats before doing this activity. Each student constructed his animal, painted it and was sent out ot "hide" his animal. All the class went out to find as many animals as they could, collect them and return to the room. The students whose animals were not collected proved their animal could survive in the habitat.

Difficulties: Some students were slow in finishing their animals and had to take them home to finish them. The paper mache is not recommended unless you have plenty of time.

Material Used: Potatoes, carrots, paper mache (newspaper-wheatpaste), paint, wire, glue, tape, popsicle sticks.

Title: Bethlehem Steel Booklet-"Steelmaking and the Environment"
Used by Donnie L. Ickles | Mark Twain Elementary | Grade Level 6th
Dec. 8/Dec. 17, 1976 | 23 Students | Others | Indoor

Appropriate grade levels 3-8

Describe activity: I put the white butcher paper on a long chalkboard in my classroom with the statement "Pollution is a dirty word" painted on it. I asked the students to draw a picture using the word pollution in their picture. I asked them to think about what comes into their minds when they heard the word pollution. After thinking they went to the board to draw what they felt about pollution.

Materials Used: Long strip of white butcher paper for mural. Crayons, felt pens, tempera paint, and pastel chalk.

Title: Setting Up On-School Environmental Site
Used by Jennie Vahrenkamp | Terrace Elementary | Grade Level 6th
88 Students | Outdoor

Appropriate grade levels 4-12

Describe activity: The students and teacher decided on a site on the school grounds. The reasons for setting up a site and what was to be observed was discussed before actually going out. The children measured the plot which is 20 X 20. This area is divided into 3 parts. One part will be roto tilled, one section mowed, and one section left in its natural state. The students will observe the changes of the 3 sections.

Material Used: Stakes, flags for stakes, tape for measuring

Title: Activity

Used by Lane Peters	Lake Highlands Jr. High	Grade Level 6-9
April, 1977	90 Students	Indoor

Appropriate grade levels 6-9

Describe activity: Students create art object (picture, jewelry, covering box or bottle) with seeds of different types. Include with the project a key identifying the various seeds and how they disperse. Students are asked to use unusual seeds. They may so outside to collect some of their seeds.

Title: Organism Interaction

Used by Janice Clevenger	Spring Creek Elem.	Grade Level
October 22, 1976	25 Students	Indoor

Appropriate grade levels 4-8

Describe activity: A set of animal drawings was used to develop students ideas and knowledge of animals. "Who Am I" game played as well as the activity illustrating food web.

Material Used: Organism Interaction cards, Yarn (red and green)

Title: Food Chain Game

Used by: Maxine Daniel	Greenwood Hills Elem.	R.I.S.D.	Grade 4
Oct. 14, 1976	28 Students	Outdoor	

Appropriate grade 5

Describe activity: After discussing the food chain concept in the classroom, we selected several children to be parts in the food chain of a community. We discribed three different types of disasters and each time the illustration revealed how the world community was affected.

Materials Used. Yarn (for Chain)

Title: Making Pangaea

Used by Vicki Keathley	Lake Highlands Junior High School	Grade Level-8
January, 1977	5 classes	Indoor

Describe activity: Each child colors in the large mt. ranges of each continent, then cuts out all the large continents, etc. Then they glue them together (puzzle like) on the plain paper the way they think they might have been. Next show them the versions of the experts.

Materials Used: large copies of world maps. 1 per student, color pencils, glue, plain paper, scissors

Difficulties: Finding the right map. They can be ordered through the Dist. or borrowed from your history dept.

How could it be done differently? They could be put in groups (5 or so) and each group given a diagram of the way the continents looked at different times. Each group constructs their map for that time. Then all maps are held up for the class to let the students try to figure out the correct order (in time) of the map. The concept of the super continent and continental drift can be effectively taught in a fun and involved way.

Title: Group Posters or Graffiti Boards
Used by Vicki Keathley | Lake Highland Jr. High | Indoor
November | 150-5 Classes

Appropriate grade levels 8-12

Describe activity: Each student is to express himself either by words or pictures on the butcher paper about a given subject. I chose "The Earth". Some jotted down facts, sayings, (original or otherwise) poems, thoughts, and feelings about the Earth. (Out of 5 classes only a few negative things were said-mostly about the pollution). It gave the kids the chance to use facts they had learned, it lets them express themselves and it also raises questions!! Afterwards I displayed the posters (which were very colorful) on the walls outside my class room. Many other students stopped to read them and a few who were not in my class added their comments.

Materials Used: Butcher paper, crayons, markers. This can be done in groups or as a class, I prefer as a class.

Title: Recognizing Rock Forms
Used by Bonnie Mitchell | Spring Creek Elem. | R.I.S.D. | Grade 4
Sept. 23, 1976 | 23 Students | Indoor

Appropriate for grade levels 4

Describe activity: Children examined the rocks: described each one; noted color, texture, feel, hardness, sheen, odor, etc.

What materials used: Set of rocks, Books on rocks, hand lens

Title: Mapping a Study Site
Used by Janice Clevenger | Spring Creek Elem. | OBIS I | Grade 6
Oct. 1 & 4, 1976 | 25 Students | Indoor and Outdoor

Appropriate grade levels 4-9

Describe activity: This is designed to allow students to map major features of an outdoor site.

Materials Used: Meter stick, string premeasured to 10 m., data board, pencils, marking pens

Title: OBIS Oil Spill
Used by Yvonne Nickerson | Northwood Jr. Hi. | OBIS II | Grade 8
Sept. 17, 1976 | 25 students | Outdoor

Appropriate for grade level 6-8

Describe activity: Oil Spill Situation Activity - Done at a stream or ocean site - Teachers or leader throws popcorn into stream- class has been divided into pairs (buddies) or teams to study. Landscape Impact, Plant Life Impact, Animal Life, Human Activities - 4 major impact groups. Each group or pair is given a card with a set of questions about their impact area.

What material used: Popcorn 33¢

Title: Plant Patterns
Used by Katherine Goodbar | Berkner High | OBIS I
Sept. 16, 1976 | 31 Students | Outdoor

Appropriate for grade levels 6-8

Describe activity: Activity took place in a field across from school unmanaged. Followed directions exactly from OBIS I.

What materials used: Squares of gummed paper with data made with felt tip pen. Cardboard covered with paper.

Title: Metric Caper OBIS
Used by Lane Peters | Lake Highland Jr. Hi. | OBIS II Grade 6-9
Sept. 17, 1976 | 90 Students | Indoor

Appropriate grade level 6-9

Describe activity: Measurements in volume, temperature, length, and weight by teams. Each team comes up with a mystery number (all measurements added together). Other teams try to guess this mystery number.

What Material used: Metric caper. Refer to OBIS for materials, Meter sticks can be used. For circular measurements yarn or string can be used.

Title: Space Laughs
Used by Vicki Keathley | Lake Highlands Jr. High | Grade 8
October 13, 1976 | 140 students | Indoor

Appropriate grade levels 8-12

Describe activity: Students in groups of 3 are to make up a cartoon about space objects, space motion, etc. They must be factual. They work in groups and draw up their cartoon. Afterwards students present their cartoons to the class students evaluate each for cleverness, Factuality, neatness. Students usually were able to pick out falacies quickly. The best can be displayed. This is also a good idea for students who are constantly asking for extra credit activities. This is just one more way of repeating material to students. I feel like I bore them by giving them the same material again, but yet I know they don't know it yet. Also let them use their information rather than just feeding it back. I was very impressed with their cartoon. They were much better than I expected. Having examples is very helpful to get them started. My favorite:

Frame 1-2 Linus and Charlie Brown are talking - Linus admits that (while looking at Jupiter through his telescope) the plant reminds him of his Aunt Bertha.

Frame 3 Because they're both the biggest in the bunch.

Materials Used: Large piece of manilla paper, crayons, black felt tip pen

Title: Birdfeeder
Used by Maxine Daniel | Greenwood Hills Elem. | OBIS II Grade 4
Sept. 18-20, 1976 | 28 Students | Indoor and Outdoor

Appropriate grade levels 4-8

Describe activity: After discussion of birds and habits, we talked about the type of results we might expect from experimenting. Each child built his own bird feeder by cutting out three sides of a gallon milk carton and nailing it to a 5' or 6' stick. These were put in their own yard for the weekend. In addition each one had a group of at least 4 activity cards to make observation reports. Bird models were made of construction paper: red, blue, brown and black. During the period of observations different models were attached to the feeder to observe what type birds were attracted or any change as a result of changing models. Another experiment used was the attachment of cat eyes to the side to observe reaction of birds.

One suggestion I would make is to have a feeder placed outside the school window for continuing the project. This would help those students who were unable to take part or who had bad results on the first project.

Materials used: Gal. Milk cartons, bird food, sticks, tacks, pattern for bird and cat eyes.

Title: St. Regis Poster
Used by: Sally Fox | Liberty Jr. High | Grade 7
Date: Continually | Indoor

Appropriate grade levels 3-12

Describe Activity: Included illustrations in plant unit, about 40 posters are available covering plant growth and development.

Materials used: St. Regis Posters are available from:

St. Regis Paper Co.
150 East 42nd Street
New York, N.Y. 10017

Title: Licken Looking
Used by Ron Studdert | Richardson Jr. Hi.
Sept. 12, 1976 | 18 Students | Outdoor | Grade 9

Appropriate for grade levels 9

Describe Activity: Licken hunting

What material used:

Title: Invent An Animal Adaptation
Used by Jennie Vahrenkamp | Terrace Elem. | OBIS I | Grade 6
Sept. 17-23, 1976 | 30 students | Outdoor

Appropriate for grade levels 5-12

Describe activity: The children invented animals and took them outside to hide them. The children try to show how animals are camouflaged in order to adapt to its habitat to survive and reproduce. The activity showed the children that when animals are well adapted to the environment their chances for survival and reproduction are greater.

What material used: Potatoes, celery, carrots, paint, popsicle sticks, glue, rice, tape, pipe cleaners.

Title: Transpiration in plants moisture makers
Used by Cathy Miller | Berkner High School | OBIS I Grade Senior
Sept. 19, 1976 | 16 Students | Indoor and Outdoor

Appropriate grade levels 7-8

Describe activity: Some students went outdoors, others stayed indoors. We got conficting data as upper vs lower sides & small vs large leaf. Suggestions-Do not attempt this activity if it has rained recently as it will cause gross experimental error. If it is done indoors, pick several varieties of plants.

What material used: CoCl paper, plants, baggies, tape. Keep CoCl paper carefully stored in plastic baggies as it will turn befor the experiment if are is humid.

Title: Change in the Environment
Used by: Maxine Daniel | Greenwood Hills Elem. | Grade 4
Oct. 9, 1976 | 28 students | Indoor and Outdoor

Appropriate grade

Describe Activity: Student took a pencil and paper outdoors, recorded as many changes as they could going on. Very high interest. Good preparation in classroom before going out is vital. My students worked on an individual basic and we stayed out about 30 minutes. They were given the boundry limits and instructed to write down, draw or bring back evidence of change. Participation was good and all brought good report back to class for follow up. As a follow up activity we planned a time capsule to place a small personal capsule for each child. Inside each capsule the child places such things as their weight, height, shoe size, address, hair sample, likes and dislikes list (food etc), sample of handwriting, art, members of family, other ideas plus a picture of each one.

Materials Used: Book Science on a Shoestring by Addison Wesley

Title: Hopper Circus
Used by Richard H. Bass | Forest Meadow Jr. Hi. | OBIS II | Grade 7-8
Sept. 22-24, 1976 | 120 + Students | Outdoor

Appropriate for grade levels 6-8

Describe activity: The students in each class were organized into work groups of 3 or 4. We went into a vacant, weed covered field and collected grasshoppers, katydid, or crickets. The nect day we used the "side show" cards and each student recorded the results and reported to the rest of the class. The high light was the hopper race. Very successful.

Materials Needed: Sweep nets are needed. A 1/2 gal. or 1 gal. waxed cardboard milk carton for every two or three students.

Title: Natural Recycling in Water
Used by Kathy Wohlgehagen | Richardson Jr. Hi. | OBIS I | Grade 7 Honors
Sept. 16, 1976 | 24 Students | Indoor

Appropriate for grade levels 4-7

Describe activity: Put some peelings in each bag - weigh and submerge in an aquatic environment. Remove, reweigh, and observe at specific times.

Material used: Vegetable peelings, mesh bag, plastic bag, used nylon stocking, aquatic environment.

Title: Sound Off
Used by Neai Frindell | Spring Creek Elem. | OBIS II | Grade 6
Sept. 17, 1976 | 24 Students | Outdoor

Appropriate for grade levels 4-6

Describe activity: Each student puts a bag over his head and is given a noisemaker. Each student is to find the person with a similiar noismaker before he is caught by a predator who had a distinct noisemeker. Number of predators and of each animal can and should vary.

What material used: Paper bags, sets of sound makers (borrowed from music room they have a wide variety of different sounds.)

Title: Population of Community
Used by: Dianne Stephens | Richardson West Jr. High | R.I.S.D. | Grade 7
October (end of month) | 28 Students | Indoor

Appropriate grade levels 7-8

Describe activity: Determine from census reports community size since 1900. Determine birth and death rate from local obituary and birth announcements.

Materials used: Richardson Daily News-Posted in room, Graph Paper, Ditto for bar graph

Title: Plants Around A Building (OBIS I)

Used by Ginger Mayo	Richardson High	OBIS I	Grade 7-10
Sept. 20, 1976	45 Students	Outdoor	

Appropriate for grade levels 7-10

Describe activity:

Purpose: To discover how the conditions around a building affect the growth of plants.

Preparation:

1) Select a building site for the activity.
2) Prepare outline maps of the building for each team of students. Also prepare a large outline map for charting the final results. The map should show only the outline of the building and any significant structures nearby.
3) Prepare action cards so each team will have a card.

Procedure:

1) Divide the group into teams of two to four.
2) Distibute outline maps and explain the orientation points of the map.
3) Pass out an action card to each group. Tell the groups to find as many examples as they can of the situation described on the card. Each group should mark the situations found on their individual map.
4) Allow fifteen or twenty minutes for observation. When the groups come back, have them transfer their findings to the larger master map using different colored pencils for each group.
5) Alter the results have been recorded, discuss what might have caused the situations that were observed.

Suggestions for the Action Cards

1) Find plants that seem to grow much larger than the same kind of plant in other places around the building.
2) Find areas where plants are growing much smaller than similar plants around the building.
3) Find an area where the number of plants in a small area is high.
4) Find an area where the number of plants in a small area is small.
5) Find areas where no plants are growing.
6) Find the least common plant growing around the building. Are there any special conditions which permit it to grow in that place or places?
7) Find the most common plant or plants growing around the building. What do you think is the reason for it?

Other Suggested Activities

1) Select an environmental variable (temperature, moisture, light, wind, etc.) and tour the site observing how plants respond to the variable.
2) Orient the outline map according to the compass, and have the students hunt for eveidence of differences in plant growth on the north, south, east, and west side of the building.
3) Can the effects of gardening or a lack of it account for growth differences?

What materials used: Action cards (provided in exercise) Outline maps of building.

Title: Mapping A Study Site
Used by Nancy McDaniel | Bowie Elem. R.I.S.D. | OBIS I | Grade 6
Sept. 17, 1976 | 35 Students | Indoor and Outdoor

Appropriate for grade levels 3-7

Describe activity: 1) Discussed predators and predatory devices 2) Discussed specifics of how they are used and which animals we know are predators 3) Gave out action card with device they are to make 4) They were assigned to decide on a specific animal which the action card would fit 5) They made their original predator devices (some make 2 for those predators with 2 basic devices) Took longer than I expected-some are still working on these 6) They learned some basic predator device or devices that their animal uses 7) They shared their devices with the class.

What material used: 1) tongue depressors 2) scotch tape 3) construction paper 4) wire (small and large) 5) small twigs and limbs 6) rubber bands 7) yarn 8) string 9) pipe cleaners 10) pins 11) brads 12) cardboard 13) paper towel rolls 14) popsicle sticks 15) masking tape 16) paper clips 17) soap etc.

Title: Mapping A Study Site
Used by Donnie L. Ickles | Mark Twain Elem. | OBIS I | Grade 6
Sept. 16,17, & 20 | 23 Students | Indoor and Outdoor

Appropriate for grade levels 5-8

Describe activity: This activity is designed to allow students to map the major features of an outdoor site on their school campus.

The class was divided into four groups. Each group was given one data-board section of the map of our outdoor study site. All the groups were then instructed to go into the field to explore and map their areas showing: trees, bushes, grasses, dead trees, logs, weed beds, ant colonies, animals burrows, and bird nest.

What materials used: 1) 4 data boards 2) 2 boxed of crayons 3) 1 marking pen (per group) 4) drawing pencils-#3

Title: Invent A Plant Adaptation
Used by Bonnie Mitchell | Spring Creek Elem. | OBIS I | Grade
Sept. 16, 1976 | 23 Students | Indoor

Appropriate for grade levels 4-12

Describe activity: Children invent a plant for certain adaptation. Draw the plant, then bend the wire as designed. Dip the wire in plastic, then put the parts together with floral tape.

What material used: Fun film, wire, floral tape, scissors

Title: Change in the Enviroment
Used by Donnie Ickles | Mark Twain Elem. | Grade 6
Oct. 22, 1976 | 23 Students | Outdoor

Appropriate grade levels 4-7

Describe activity: I prpared my class by having a class discussion about changes that take place in our environment. For an example, we discussed changes which have taken place in our school environment. The students were instructed to go out to our school environmental site to record changes that have taken place. They returned to the class and wrote reports on their observations.

Materials used: Pencils or pens, paper (notebook & manila), crayolas or map pencils.

Title: Adaptation - Predator - Prey
Used by Nancy McDaniel | Bowie Elem. R.I.S.D. | OBIS I | Grade 6
Sept. 17, 1976 | 35 Students | Indoor and Outdoor

Appropriate for grade levels 3-7

Describe activity: 1)Discussed predators and predator devices 2)Discussed specifics of how they are used & which animals we know are predators 3)Gave out action card with device they are to make 4)They were assigned to decide on a specific animal which the action card would fit 5)They made their orginal predator devices (some made 2 for those predators with 2 basic devices) Took longer that I expected-some are still working on these 6)They learned some basic predator device or devices that their animal uses 7)They shared their devices with the class. (This activity can't be done without securing OBIS I Kit to secure action card titles)

What materials used: 1)tongue depressors 2)scotch tape 3)construction paper 4)wire (small & large) 5)small twigs & limbs 6)rubber bands 7)yarn 8)string 9)pipe cleaners 10)pins 11)brads 12)cardboard 13)paper towel rolls 14)popsicle sticks 15)masking tape 16)paper clips 17)soap, etc.

Title: Natural Recycling in Soil
Used by Charlotte Klenk | Westwood Jr. High | OBIS I | Grade 8
Sept 1976 | Outdoor

Appropriate grade 5-8

Describe activity: Put garbage in each of the three bags and weigh each. Then bury each bag at the same depth and leave a lone about 2 weeks. Dig up and weigh.

Material Used: Plastic bag, netting, nylon, hose, garbage, string, digging tools

Title: Bean Bugs

Used by Janice Clevenger	Spring Creek Elem.	OBIS I	Grade 6
Sept. 17, 1976	24 Students	Outdoor	

Appropriate for grade levels 5-9

Describe activity: This activity is suggested for use in estimating populations of organisms too numerous to count. The census is conducted by a quadrat technique. Beans are distributed over a prescribed area and students are asked to calculate number of organisms by taking random samples, finding an average and then estimating number in the prescribed area.

What materials used: 1) one pound bean bugs 2) meter stick 3) string 4) 4 large nails 5) wire quadrat 1 dec. x 1 dec. square

Title: Water Breathers

Used by Sally Fox	Liberty Jr. High	OBIS II
Sept. 16, 1976	29 Students	Indoor

Appropriate for grade level 5-7

Describe activity: Each group of 4 students had beaker with water containing 1 aquatic animal (crawfish, tadpole, tropical fish, etc.) which had been brought by students the day before. Dropping 1 or 2 drops of food coloring to indicate various invisible current set up by animal.

What material used: 400 ml beakers, hand lenses (10x) food coloring, dropping pipettes

Title: Invent an Animal Adaptation
Used by Nancy McDaniel | James Bowie Elementary | Grade Level 6
November 19, 1976 | 35 Students | OBIS I | Outdoor

Appropriate grade levels 3-6

Describe activity: To make an animal that can't be found by hiding it in its habitat. Their camouflage should have kept their animals from being found.

Material Used: Paint, glue, potatoes, wire, yarn, pipe cleaners, beans, carrots, etc. - all types of odds and ends.

Title: Invent a Plant
Used by Nancy McDaniel | James Bowie Elementary | Grade Level 6
December 8, 1976 | 35 Students | OBIS I | Indoor

Appropriate grade levels 4-6

Describe activity: Students were to make a model of a plant that showed the basic things that made it adapt to its natural habitat.

Material Used: Paper, wire, pipe cleaners, tape

Title: Roots and Shoots
Used by Nancy McDaniel | James Bowie Elementary | Grade Level 6
February 2, 1977 | 35 Students | OBIS II

Appropriate grade levels 4-7

Describe activity: Divided into groups of five - class had to see if they can match.

Material Used: Weeds from outside, roots

Title: Lichen Looking
Used by Nancy McDaniel | James Bowie Elementary | Grade Level 6
January 26, 1977 | 35 Students | OBIS II | Outdoor

Appropriate grade levels 4-8

Describe activity: Went over what we were to look for - groups of three - They were to see how many types of lichens we could find.

Material Used: Trees outside the school building, pencil and paper

Title: Metric Capers
Used by Nancy McDaniel | James Bowie Elementary | Grade Level 6
January 19, 1977 | 35 Students | OBIS II

Appropriate grade levels 5-7

Describe activity: Measured common outdoor items by regular measurement and by metrics.

Material Used: Metric rulers and sticks, plants, other things from outdoors

Title: School Population Study
Used by Charlotte Klenk | Westwood Junior High | Grade level 8th
February 21, 1977 | 139 Students | Indoor

Appropriate grade levels 7-12

Describe activity: Draw graph of school population and anticipated trend. Then do discussion questions.

Material Used: Supplemental Activities Guide to Environmental Science-RISD by Campanella, Goodbar, McBride

Title: Discovering the Unique Properties of Water
Used by Charlotte Klenk | Westwood Junior High | Grade level 8th
February 21, 1977 | 34 Students | Indoor

Appropriate grade levels 7-12

Describe activity: Detecting calcium and magnesium salts in the water, by desolving $Ca(OH)_2$ in water then letting the salt settle out. Then adding Na_2CO_3 for removing additional calium ions.

Materials Used: Supplemental Activities Guide to Environmental Science - RISD by Campanella, Goodbar, McBride

Title: Ways to Identify Rock-forming Minerals by Characteristics
Used by Charlotte Klenk | Westwood Junior High | Grade level 8th
January 31, 1977 through February 5, 1977 | 175 Students | Indoor

Appropriate grade levels 8-12

Describe activity: Taking one mineral test for all its physical and chemical properties

Materials Used: Supplemental Activities Guide to Environmental Science - RISD by Campanella, Goodbar, McBride

Title: Recognizing Igneous, Sedimentary, and Metamorphic Rock
Used by: Charlotte Klenk | Westwood Junior High | Grade level 8th
February 7, 1977 through February 18, 1977 | 175 Students | Indoor

Appropriate grade levels 8-12

Describe activity: To identify rocks by composition and texture.

Materials Used: Supplemental Activities Guide to Environmental Science - RISD by Campanella, Goodbar, McBride

Development of a Modified Outdoor School Site (Aquatic)

by Cathy Miller, Berkner High School

I. Materials List:
- Plastic containers of equal size
- Pond water
- Tap water
- Microscope
- Slides
- Coverglass
- Dropping pipettes
- pH paper
- Thermometer
- Petri dishes
- Agar
- Inocupating loops
- Autoclave
- Chemicals
- D.O. kits
- Ion kits

II. Procedure
- A. Get permission to excavate from building principal
- B. Excavate the site and bury two containers in an enclosed area (i.e. courtyard) and two containers in an exposed area
- C. Fill one container in each location with tap water and one container in each location with pond H2O
- D. Procedure from the point will vary according to the various parts of the exercise undertaken

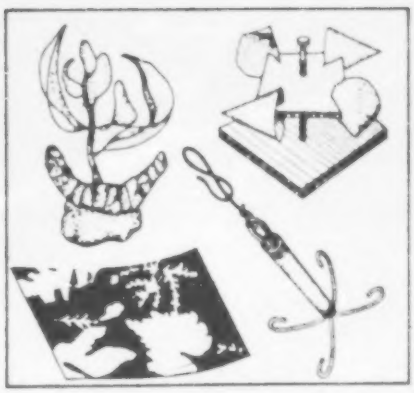
III. Suggested projects
- A. Relationship between temp, pH, and algae growth
- B. Relationship between temp, pH, and protozoan growth
- C. Relationship between dissolved oxygen and temperature
- D. Relationship between dissolved oxygen and animal life
- E. Relationship between dissolved oxygen and plant life
- F. Ion changes over time
- G. Ion differences between tap water and pond water
- H. Algae taxonomy studies
- I. Protozoan tazonomy studies
- J. Bacteria studies (Planting, identification of major group types, isolation techiques, straining, etc.)

IV. Feedback - key log of input by students and any other teachers for future adaptation and exaluation

LEARNING GAMES

For you to duplicate and use.

Any of the following games may be reproduced for use with students.



POLLUTANTS PUZZLE

This puzzle could be used in a variety of ways.

1. The puzzle could just be handed to the students to find any words that deal with pollutants.

2. The student could be given a list of words to find in the puzzle.

3. The students might be given a list of the definitions and be told to find the word after matching them with the definitions.

4. They might be given the words and be asked to define them first and then find them on the puzzle.

NOTE: THE WORDS ARE ARRANGED ACROSS, UP, DOWN, DIAGONAL AND BACKWARD.

POLLUTANTS

T N E X G O M I S T Z Q E G A W E S

S I W D H E A V Y M E T A L S X W Y

C T Z S I Q S E D I C I B R E H G N

I R H F W X K S X H W G S O Z U S E

T O S D S N O B R A C O R D Y H E R

S G A H P C Z N F Z D F W O K O D G

A E O S C X T D O E N Z H R X N I I

L N W D B G Z Q D M K O B S D O X S

P O Y K S E W E W D N D T F Q I O M

A X R B Q H S E D I R O U L F S R O

O I U F Z I N T B O I L B S B O U K

K D C W O D S M O G X A M R T R F E

H E R N Q E Z A M S K O N W A E L Z

S S E T A H P S O H P C Z G X C U F

A Z M Z W P A R T I C U L A T E S X

1. DDT
2. Ash
3. Carbon monoxide
4. Hydrocarbons
5. Nitrogen oxides
6. Sulfur oxides
7. Particulates
8. Fluorides
9. Asbestos
10. Heavy metals
11. Fog
12. Haze
13. Smaze
14. Synergism
15. Smoke
16. Dust
17. Smog
18. PCBS
19. Mist
20. Noise
21. Herbicides
22. Coal
23. Odors
24. Mercury
25. Lead
26. Phosphates
27. Sewage
28. Erosion
29. Oil
30. Plastics

POLLUTANTS

T N E X G O M I S T Z Q E G A W E S

S I W D H E A V Y M E T A L S X W Y

C T Z S I Q S E D I C I B R E H G N

I R H F W X K S X H W G S O Z U S E

T O S D S N O B R A C O R D Y H E R

S G A H P C Z N F Z D F W O K O D G

A E O S C X T D O E N Z H R X N I I

L N W D B G Z Q D M K O B S D O X S

P O Y K S E W E W D N D T F Q I O M

A X R B Q H S E D I R O U L F S R O

O I U F Z I N T B O I L B S B O U K

K D C W O D S M O G X A M R T R F E

H E R N Q E Z A M S K O N W A E L Z

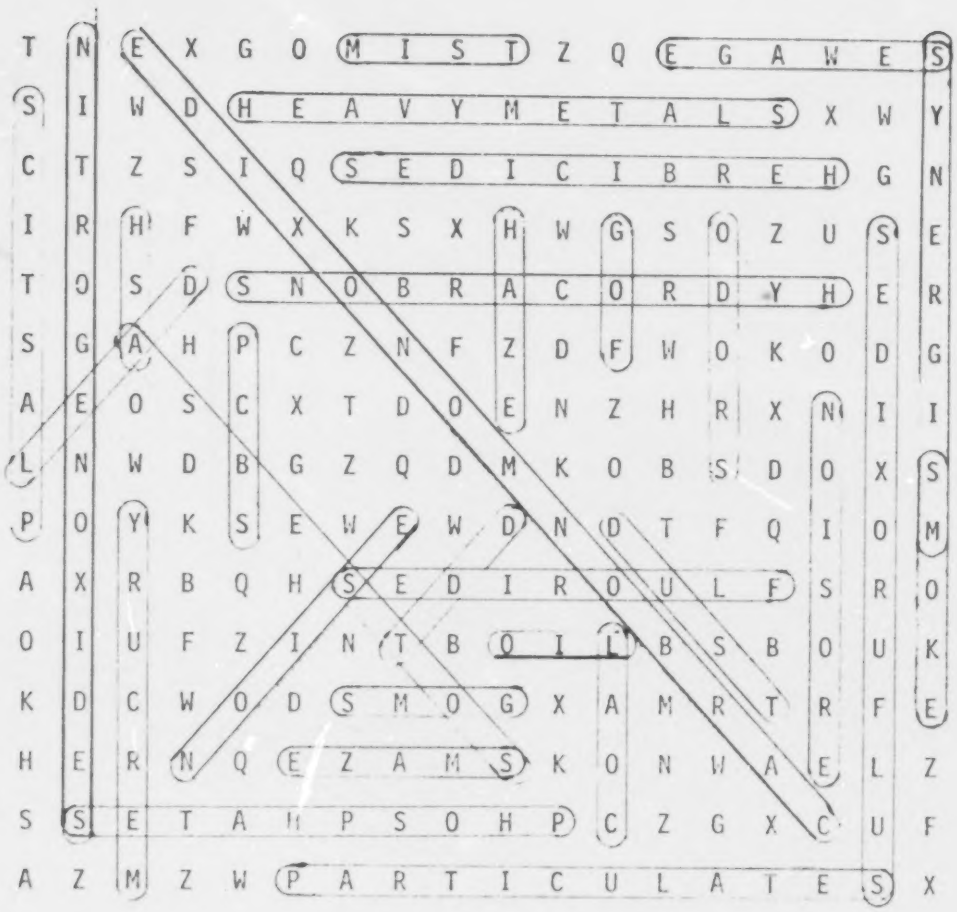
S S E T A H P S O H P C Z G X C U F

A Z M Z W P A R T I C U L A T E S X

WORDS FOR POLLUTANTS PUZZLE

1. DDT
2. Ash
3. Carbon monoxide
4. Hydrocarbons
5. Nitrogen oxides
6. Sulfur oxides
7. Particulates
8. Fluorides
9. Asbestos
10. Heavy metals
11. Fog
12. Haze
13. Smaze
14. Synergism
15. Smoke
16. Dust
17. Smog
18. PCBS
19. Mist
20. Noise
21. Herbicides
22. Coal
23. Odors
24. Mercury
25. Lead
26. Phosphates
27. Sewage
28. Erosion
29. Oil
30. Plastics

POLLUTANTS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S I W D H E A V Y M E T A L S X W Y
C T Z S I Q S E D I C I B R E H G N
I R H F W X K S X H W G S O Z U S E
T O S D S N O B R A C O R D Y H E R
S G A H P C Z N F Z D F W O K O D G
A E O S C X T D O E N Z H R X N I I
L N W D B G Z Q D M K O B S D O X S
P O Y K S E W E W D N D T F Q I O M
A X R B Q H S E D I R O U L F S R O
O I U F Z I N T B O I L B S B O U K
K D C W O D S M O G X A M R T R F E
H E R N Q E Z A M S K O N W A E L Z
S S E T A H P S O H P C Z G X C U F
A Z M Z W P A R T I C U L A T E S X

ECOLOGY PUZZLE

This puzzle could be used in a variety of ways

1. The puzzle could just be handed to the students to find any word that deal with ecology.

2. The student could be given a list of words to find in the puzzle.

3. The student might be given a list of the definitions and be told to find the word after matching them with the definitions.

4. They might be given the words and be asked to define them first and then find then on the puzzle.

NOTE: THE WORDS ARE ARRANGED ACROSS, UP, DOWN, DIAGONAL AND BACKWARD.

ECOLOGY

S X D C Y P L M E R E H P S O I B C

T F O O D C H A I N R Q N R D Z S O

N L L N E R A B I O T I C E M N E M

E O R S N L Q K M H O S T C L B I M

M C E U E U V E S B E A Z U D J C E

N K S M R D T L Z T P R N D K D E N

O V O E G S R M C B E W D O O F P S

R Z P R Y P M N C S M Q V R O L S A

I Y M S N O I T A L U P O P J M P L

V N O I K T M S I T I S A R A P Z I

N C C L X U I B L S Y M B I O S I S

E H E E Q L C T Z M S I L A U T U M

E R D P T E R R I T O R Y L S J T X

E C O L O G Y T E I C O S L O Q Z R

WORDS TO BE USED WITH ECOLOGY WORD-FIND

1. Food chain
2. Population
3. Producers
4. Consumers
5. Ecosystem
6. Food web
7. Decomposer
8. Mimicry
9. Symbiosis
10. Commensalism
11. Mutualism
12. Parasitism
13. Host
14. Society
15. Flock
16. Herd
17. Territory
18. Abiotic
19. Niche
20. Ecology
21. Environment
22. Biosphere
23. Species
24. Extinct
25. Energy

ECOLOGY

S X D C Y P L M E R E H P S O I B C

T F O O D C H A I N R Q N R D Z S O

N L L N E R A B I O T I C E M N E M

E O R S N L Q K M H O S T C L B I M

M C E U E U V E S B E A Z U D J C E

N K S M R D T L Z T P R N D K D E N

O V O E G S R M C B E W D O O F P S

R Z P R Y P M N C S M Q V R O L S A

I Y M S N O I T A L U P O P J M P L

V N O I K T M S I T I S A R A P Z I

N C C L X U I B L S Y M B I O S I S

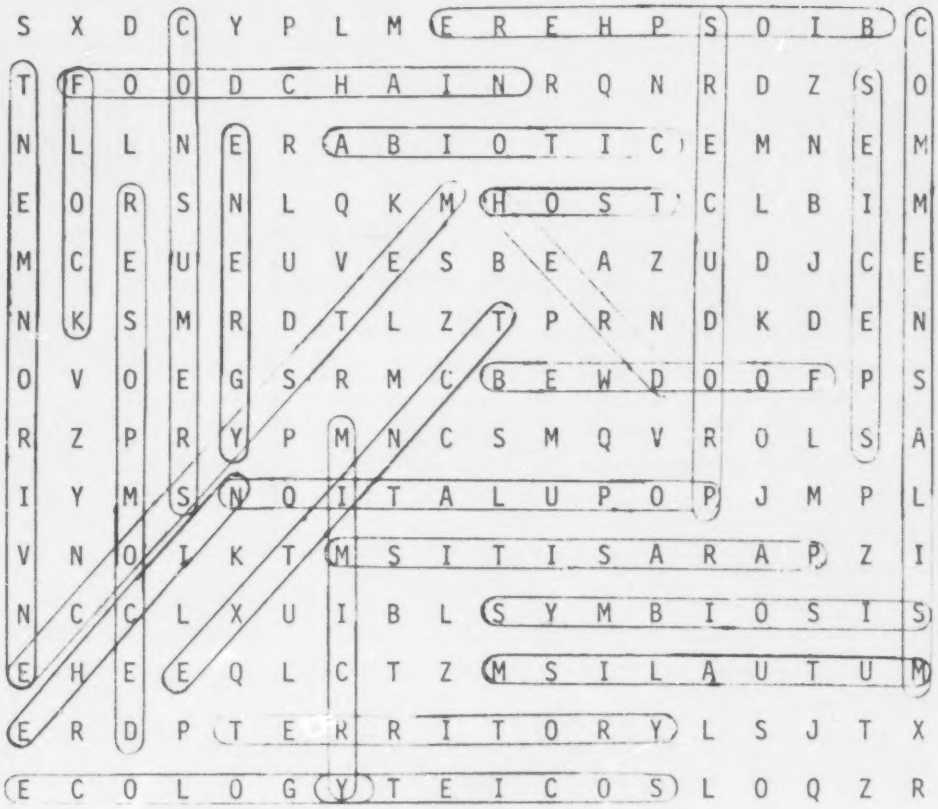
E H E E Q L C T Z M S I L A U T U M

E R D P T E R R I T O R Y L S J T X

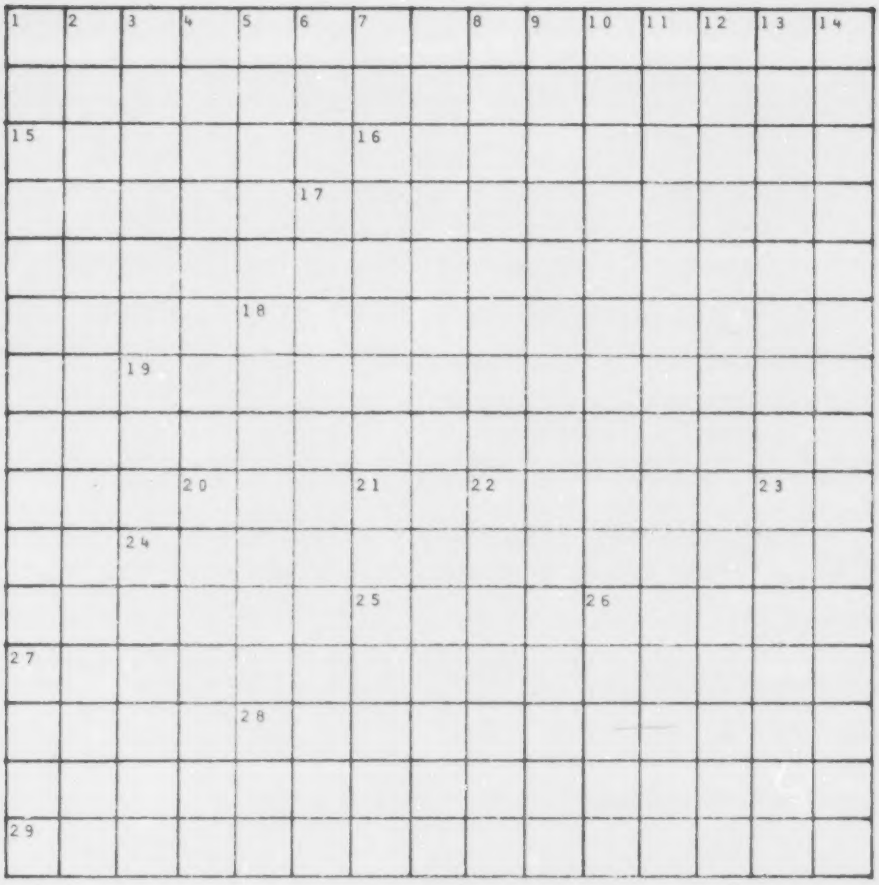
E C O L O G Y T E I C O S L O Q Z R

1. Food chain
2. Population
3. Producers
4. Consumers
5. Ecosystem
6. Food web
7. Decomposer
8. Mimicry
9. Symbiosis
10. Commensalism
11. Mutualism
12. Parasitism
13. Host
14. Society
15. Flock
16. Herd
17. Territory
18. Abiotic
19. Niche
20. Ecology
21. Environment
22. Biosphere
23. Species
24. Extinct
25. Energy

Ecology Answer Key


S X D C Y P L M E R E H P S O I B C
T F O O D C H A I N R Q N R D Z S O
N L L N E R A B I O T I C E M N E M
E O R S N L Q K M H O S T C L B I M
M C E U E U V E S B E A Z U D J C E
N K S M R D T L Z T P R N D K D E N
O V O E G S R M C B E W D O O F P S
R Z P R Y P M N C S M Q V R O L S A
I Y M S N O I T A L U P O P J M P L
V N O L K T M S I T I S A R A P Z I
N C C L X U I B L S Y M B I O S I S
E H E E Q L C T Z M S I L A U T U M
E R D P T E R R I T O R Y L S J T X
E C O L O G Y T E I C O S L O Q Z R

ECOLOGY



ACROSS

1. Study of the environment
8. Term given to the nonliving part of the environment
15. A jungle cat
17. Decomposed organic matter mixed with soil
19. Animals which feed on other dead animals
20. Tiny channels caused by flowing water
22. Number of organisms in a given area
25. Period of time between birth and death (2 words)
27. Physical state exhibited by water vapor

ACROSS
(Continued)

28. Organisms that break down tissues and excretions of other organisms

29. An inactive period during the summer months

DOWN

1. Death of an entire species

3. A complete and entire living thing

9. Entire world of living things

11. One name given to a body of water

14. All the populations in a well-defined area

16. The ultimate source of all energy

18. Living in salt water

21. A shade of purple

23. Habitat found in the polar regions

24. An area that receives less than 25 cm. of rain per year

26. Combination of smoke and fog

ECOLOGY

(Answer Key)

1 E	2 C	3 O	4 L	5 O	6 G	7 Y		8 A	9 B	10 I	11 O	12 T	13 I	14 C
X		R							I		C			O
15 T	I	G	E	R		16 S			O		E			M
I		A			17 H	U	M	U	S		A			M
N		N				N			P		N			U
C		I		18 M					H					N
T		19 S	C	A	V	E	N	G	E	R	S			I
I		M		R					R					T
O			20 R	I	L	21 L		22 D	E	N	S	I	23 T	Y
N		24 D		N		I							U	
		E		E		25 L	I	F	E	26 S	P	A	N	
27 G	A	S				A				M			D	
		E		28 D	E	C	O	M	P	O	S	E	R	S
		R								G			A	
29 E	S	T	I	V	A	T	I	O	N					

NATURAL CYCLES
(Answer Key)

CYCLES:

CARBON	NUTRIENT
NITROGEN	OXYGEN
PHOSPHORUS	

TERMS:

NITROGEN-FIXING BACTERIA	N_2
DECAY	NITRATES
AMMONIA	DENITRIFICATION
NODULES	LEGUMES
NITROGEN FIXATION	GREENHOUSE EFFECT
FOSSIL FUELS	PHOTOSYNTHESIS
RESPIRATION	PRODUCERS
PRIMARY CONSUMERS	SECONDARY CONSUMERS
DECOMPOSERS	SCAVENGERS

This is a cryptogram activity. To find the answers the students are to discover the letters that correspond to the jumbled letters. For example in this puzzle the letter X corresponds to the correct letter C.

NATURAL CYCLES

XGXTPA:

XUCIKY

YSFCKDPY

ZQKAZQKCBA

YBFCSPYF

KHGDPY

FPCEA:

YSFCKDPY-WSHSYD IUXFPCSU

MPXUG

UEEKYSU

YKMBTPA

YSFCKDPY WSHYFSKY

WKAAST WBPTA

CPAZSCUFSKY

ZCSEUCG XKYABEPCA

MPXKEZYAPGA

Y_2

YSFCUFPA

MPYSFCSWSXUFSKY

TPDBEPA

DCPPYQKBAP PWWPXF

ZQKFKAGYFQPASA

ZCKMBXPCA

APXKYMUCG XKYABETCA

AXUJPYDPCA

BIOMES ANSWER KEY

DESERT	TROPICAL RAIN FOREST
TUNDRA	TIAGA
LAKE	INTERTIDAL ZONE
GRASSLANDS	SAVANNAHS
CONIFEROUS FOREST	DECIDUOUS FOREST
SHORE LINE	OCEAN
SOIL	RIVER

This is a cryptogram activity. To find the answers the students are to discover the letters that correspond to the jumbled letters. For example in this puzzle the letter T corresponds to the correct letter D.

BIOMES

TPHPJA

AYBTJM

EMDP

LJMHHEMBTH

ZJMRJRPH

SCBRVPJCYH VCJPHA

HQCJP ERBP

HCRE

AJCZRSME JMRB VCJPHA

ARMLM

RBAPJARTME OCBP

ZEMRBH

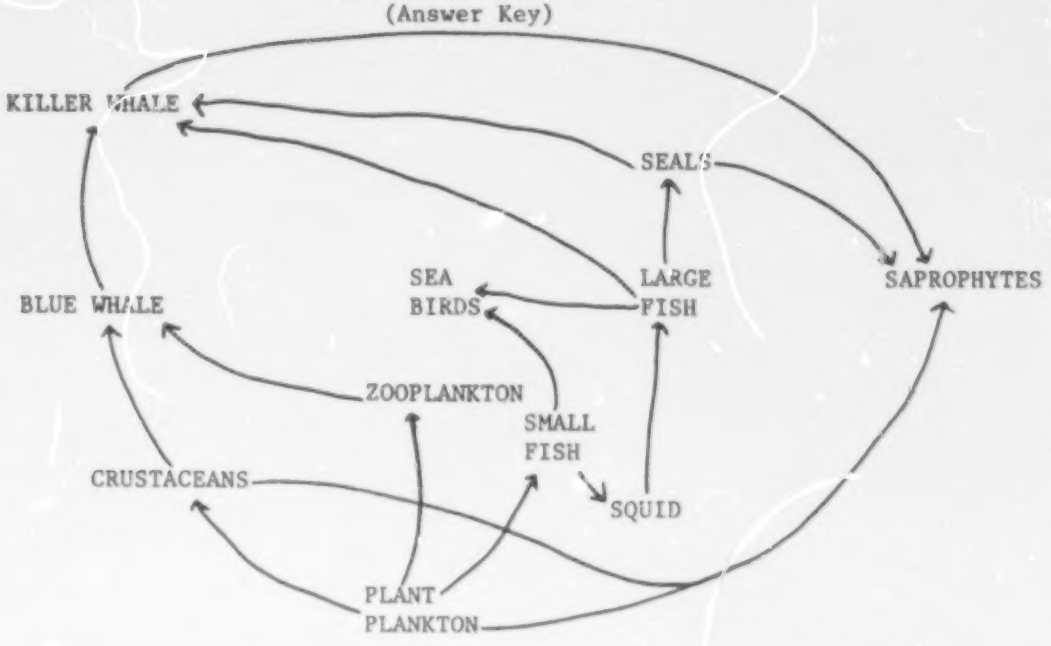
HMKMBBMQH

TPSRTYCYH VCJPHA

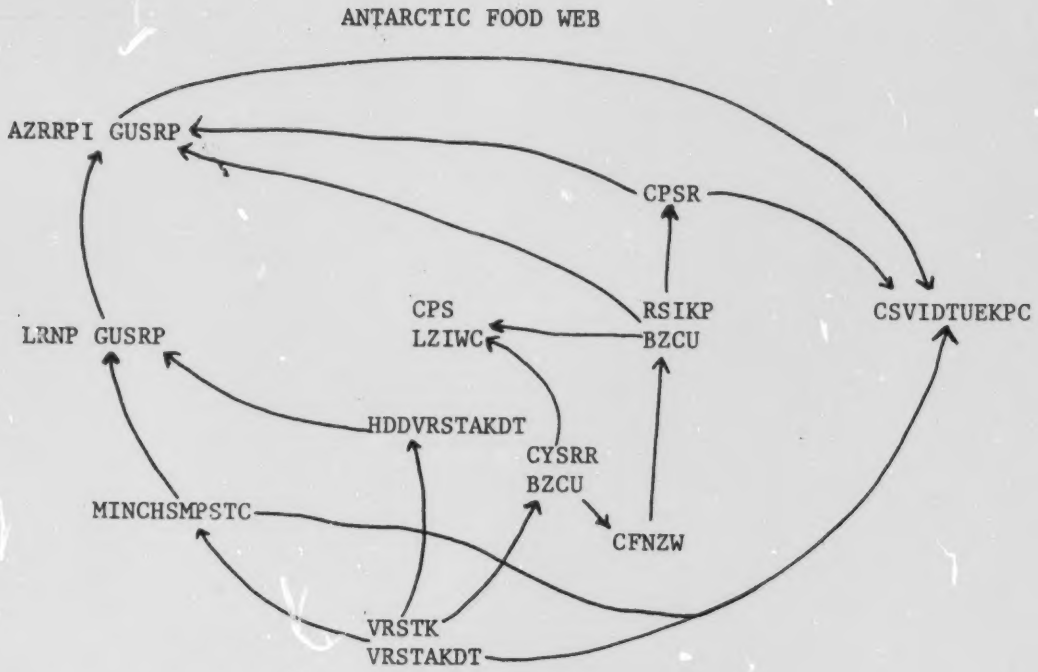
CSPMB

JRKPJ

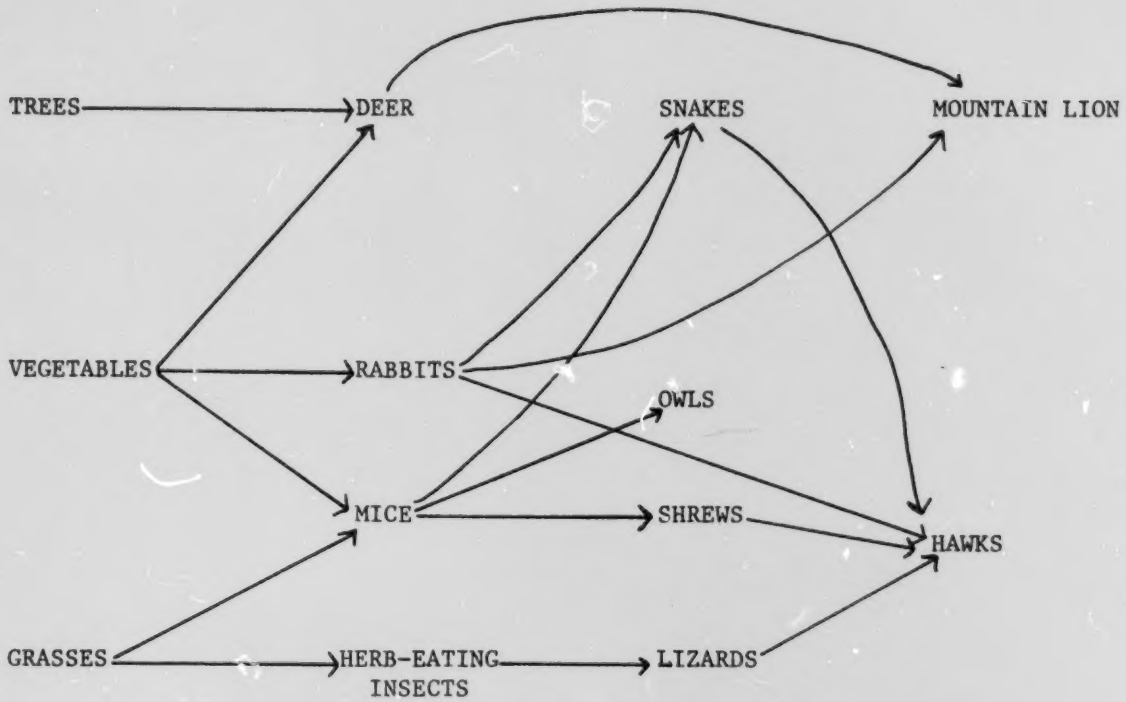
ANTARCTIC FOOD WEB
(Answer Key)



This is a cryptogram activity. To find the answers the students are to discover the letters that correspond to the jumbled letters. For example in this puzzle the letter A corresponds to the correct letter K.

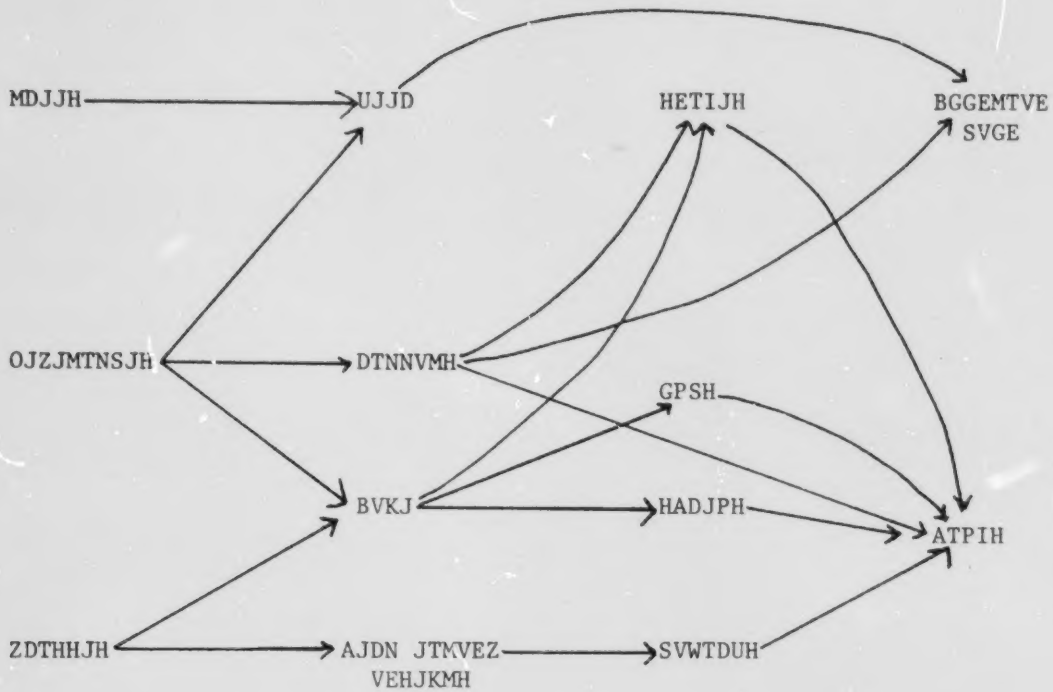

ANTARCTIC FOOD WEB
AZRRPI GUSRP
CPSR
CPS
LZIWC
RSIKP
BZCU
CSVIDTUEKPC
LRNP GUSRP
HDDVRSTAKDT
CYSRR
BZCU
MINCHSMPSTC
CFNZW
VRSTK
VRSTAKDT

ANSWER KEY FOR TERRESTRIAL FOOD WEB



This is a cryptogram activity. To find the answers the students are to discover the letters that correspond to the jumbled letters. For example in this puzzle the letter M corresponds to the correct letter T.

TERRESTIAL FOOD WEB



HEREDITY MYSTERY

On June 12, 1964, at 12 midnight 3 children were being born at General Hospital, one to the Smith's, one to the Jones', and one to the Green's. At 12:05, a bomb went off in the hospital. The hospital burned to the ground, destroying all records, and before an ID bracelet had been attached to the wrists of the babies. All were saved but no one knew which child was which. Everyone drew straws to decide which child they would take home. Years passed. All the couples continued to have secret doubts whether or not they had chosen their own child. Suddenly, Mr. Jones, a millionaire, died of a heart attack. In his will he has left all his money to his <u>real</u> child, and the money cannot be touched until the mystery is solved. With your knowledge of genetics <u>you</u> have been called in to solve the mystery. If you can solve it, you will collect $100,000. Good luck.

Use the following clues to fill in the chart you have been given. Then decide whose child is whose.

Mrs. Jones has attached ears which show when she wears her diamond ear rings.

Gerald can roll his tongue.

Jim has a widow's peak that shows when he goes swimming.

Mr. Smith has had bent little fingers in his family for generations.

Sally is homozygous for free ears.

Mr. and Mrs. Green can roll their tongues but both had one parent who couldn't.

Mr. and Mrs. Smith found that no matter how hard they tried, they could not taste PTC.

Gerald is heterozygous for free ears.

Mrs. Jones' little finger is bent, but her father's was straight.

Mr. Jones cannot taste PTC.

Mrs. Jones' family have been tasters for generations.

Mrs. Green has attached ears but Mr. Green's family has had free ears for generations.

Mrs. Green uses her little finger as a straight edge.

Mrs. Smith thinks her widow's peak is attractive.

Mr. Jones had free ears but his mother's were attached.

Sally cannot taste PTC.

Mr. Green's finger is bent but his father had a straight one.

Mr. and Mrs. Smith have had free ears in both their families for generations.

Gerald put some PTC paper in his mouth but could not taste it.

Jim's ears are attached.

Mr. Jones' little finger was straight.

Sally tried but could not roll her tongue.

Mrs. Jones has a straight hair line.

Neither Mr. or Mrs. Green have a widow's peak.

Both Mr. and Mrs. Smith are heterozygous for tongue rolling as both their mothers could not roll.

Mr. and Mrs. Green can taste PTC paper, but both of their fathers cannot.

Gerald is a straight boy. Both his little finger and hairline are straight.

Jim practiced many hours but could not roll his tongue.

Sally is homozygous for bent little finger.

Both Mr. Jones and Mr. Smith hide their widow's peaks by combing their hair foreward. They are embarressed over them as neither of their fathers had one.

Neither Mr. or Mrs. Jones can roll their tongues, although they took lessons.

Sally has a widow's peak.

Jim has a bent finger.

Mrs. Smith has a bent finger but her mother had a straight one.

Jim can taste PTC.

TRAITS

Free earlobes - FF or Ff	Attached - ff
Widow's Peak - WW or Ww	Straight - ww
PTC taster - TT or Tt	Nontaster - tt
Bent finger - BB or Bb	Straight - bb
Tongue roller - RR or Rr	Nonroller - rr

PARENTS

	Mrs. Jones	Mr. Jones	Mrs. Green	Mr. Green	Mrs. S	Mr. S
Ears						
Hair						
PTC						
Finger						
Roll						

Children

	Gerald	Jim	Sally
Ears			
Hair			
PTC			
Finger			
Roll			
Real Parents			

Who inherited the fortune? _____

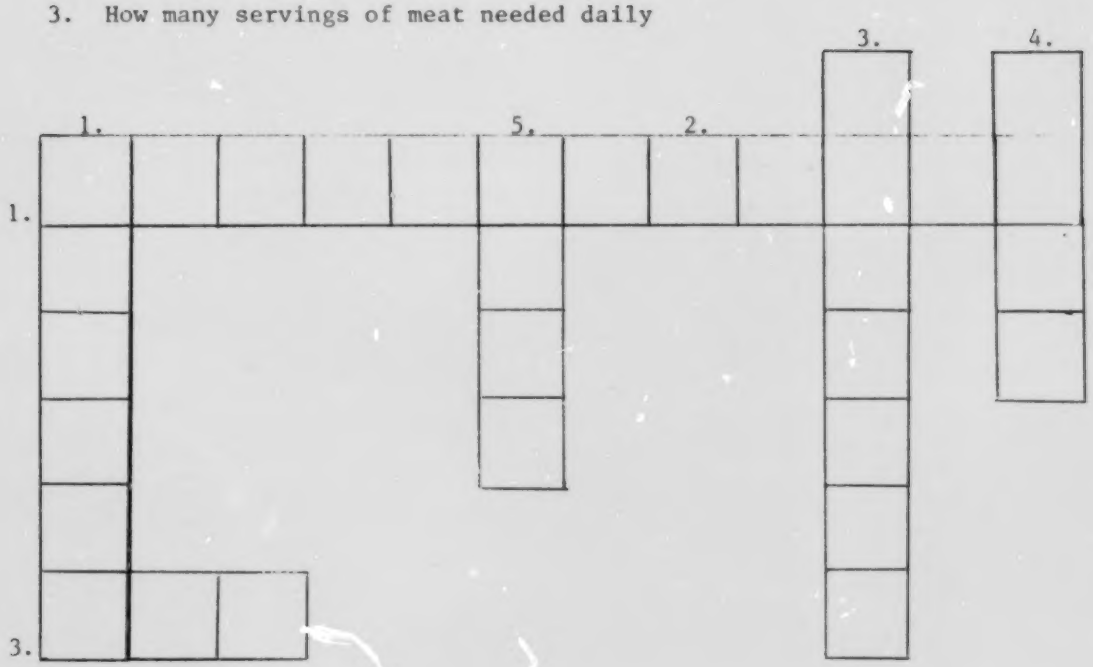
Nutrition Cross Word Puzzle

Down

1. A source for Vitamin A
2. Name of the "Sunshine" Vitamin
3. Builds strong bones and teeth
4. What food group is peanut butter in
5. Fat provides

Across

1. Sugar is a.....
2. Carrot is high in this vitamin
3. How many servings of meat needed daily



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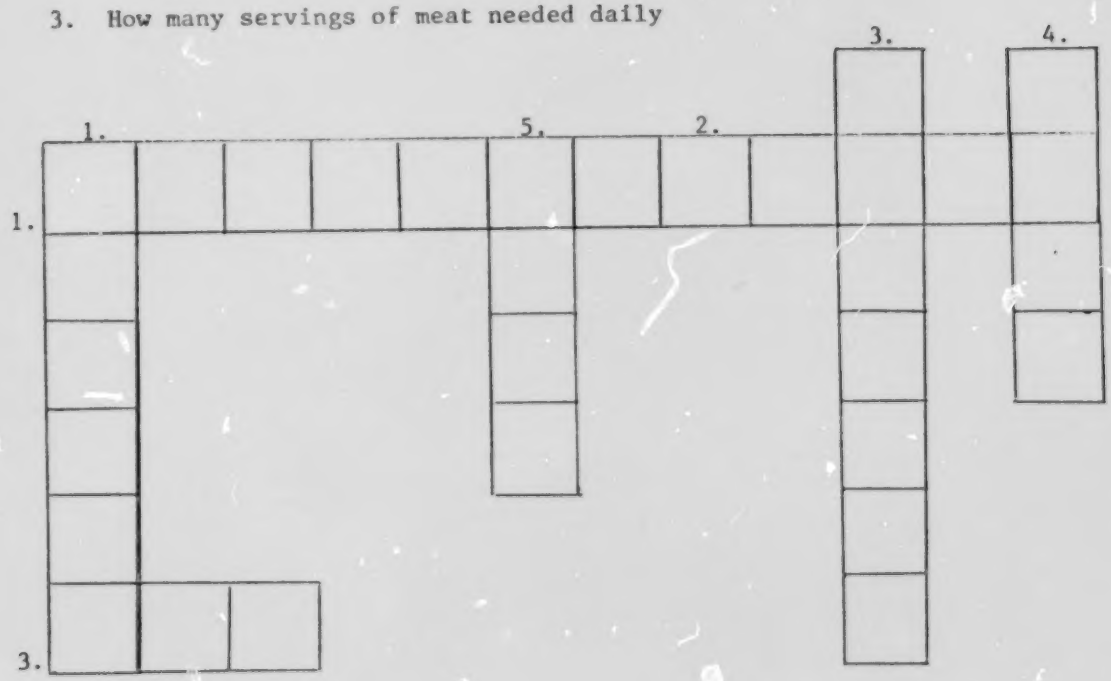


Plant Puzzle

This puzzle could be used in a variety of ways.

1. The puzzle could just be handed to the students to find any words that deal with plants.
2. The student could be given a list of words to find in the puzzle.
3. The students might be given a list of the definitions and be told to find the word after matching them with the difinitions.
4. They might be given the words and be asked to define them first and then find them on the puzzle.

Note: The words are arranged across, up and down, diagonal and backward.

PLANTS

CIRCLE THE WORDS DEALING WITH PLANTS

H	E	S	O	C	U	L	G	K	M	B	E	L	C	I	T	U	C
E	E	L	N	Q	X	W	S	I	M	R	E	D	I	P	E	J	A
R	N	X	B	K	P	H	Z	C	A	M	B	I	U	M	L	C	R
B	M	F	C	B	F	O	F	X	X	Y	L	E	M	T	D	H	O
A	F	P	O	U	C	R	R	I	A	H	T	O	O	R	L	R	T
C	E	E	R	N	R	L	G	T	A	P	T	M	Z	N	E	O	E
E	L	R	T	D	H	E	D	N	E	M	A	T	S	P	U	M	N
O	C	E	E	L	L	D	F	I	B	R	O	U	S	E	C	O	E
U	Y	N	X	E	S	T	O	M	A	T	A	Z	Z	S	O	P	J
S	C	N	L	A	U	N	N	A	M	C	X	M	G	O	P	L	O
G	I	I	L	E	L	L	A	R	A	P	P	D	T	L	L	A	X
T	R	A	C	H	E	O	P	H	Y	T	A	N	H	U	A	S	Y
C	E	L	K	D	E	C	L	I	X	A	E	G	N	L	S	T	G
V	P	L	Z	L	A	B	W	G	B	R	X	M	U	L	T	K	E
F	H	I	E	P	V	A	Y	Z	R	L	W	E	S	E	V	M	N
G	W	T	T	M	T	K	J	U	S	K	C	O	P	C	C	O	E
T	S	S	P	E	L	E	C	I	T	N	E	L	N	B	D	Z	T
J	V	I	R	L	L	X	D	V	K	G	Z	H	J	E	K	C	Q
L	O	P	X	B	E	H	Z	B	R	Y	O	P	H	Y	T	A	R

Words Used in Plant Puzzle

1. Stomata
2. Excurrent
3. Cuticle
4. Xylem
5. Tracheophyta
6. Tap
7. Bryophyta
8. Glucose
9. Carotene
10. Leucoplast
11. Pericycle
12. Cortex
13. Wat[illegible]
14. Cellulose
15. Lenticel
16. Whorled
17. Parallel
18. Pistil
19. Phloem
20. Node
21. Chromoplast
22. Epidermis
23. Fibrous
24. Annual
25. Herbaceous
26. Axil
27. Root hair
28. Stamen
29. Perennial
30. Bundle
31. Cambium
32. Stele
33. Sun
34. Oxygen
35. Net

Plant Definitions

1. Opening between 2 guard cells
2. Type of branching in which there is a single trunk extending through the tree as a single shaft.
3. Wax-like covering on a leaf
4. Conducting tissue used to conduct water upward
5. Phylum that includes the trees
6. Type of root system in which there is one main root
7. Phylum that includes the mosses and liverworts
8. The main end product of photosynthesis
9. Orange pigment found in plants
10. Type of plastid that stores starch
11. Root tissue that gives rise to secondary roots.
12. Main storage area in the root
13. The raw material other than CO_2 used for photosynthesis
14. Material that makes up the cell wall of a plant cell
15. Pore found in the external structure of a woody stem
16. Type of leaf arrangement in which there are more than one leaf at a particular position on the stem
17. Type of vein arrangement in which all the veins begin at the petiole and end at the apex.
18. The name given to the entire female reproductive structure in the flower
19. Type of vascular tissue that conducts food downward
20. Point of attachment of a leaf or branch on a stem
21. Type of plastid that stores carotenes and xanthophylls
22. A single-layer of cells on a root or leaf that serves as protection

23. Type of root system in which all roots are about the same size

24. Name given to a plant that lives only one year

25. Name given to plants that have soft green stems

26. Angle between the stem and a petiole

27. Extensions of the epidermal cells of the root that increase absorption area

28. Name given to the male reproductive structure in the flower

29. Name given to a plant that lives for more than 3 years

30. Type of scar on the woody stem that indicated where the vasculas tissue was

31. Tissue found between the xylem and phloem that increases the size of a root or stem

32. Another name for the central cylinder of a root

33. Source of energy for photosynthesis

34. A vital substance besides glucose produced by phopsynthesis

35. Another name for pinnate venation

FOOD GAME

A card game for all levels of reading students

1. Two or three may play

2. Choose for dealer

3. Deal 8 cards to each player. Turn up one card. Place rest of deck face down.

4. Starting at dealer's left, each player in turn draws a card. He may draw top card from deck, or the top face-up card. He discards one card face up.

5. A player may knock when he holds cards for 2 different meals. Each meal must have one food from each of the Basic Four food groups. The player lays down his hand.

6. Others check the hand. If the lpayer knocked correctly, he gets 2 points. If he did not have the correct knock, he loses one point.

7. If deck is used up and no player has knocked, turn over the face-up pack and continue.

8. The winner is the player with the most points when game is called.

9. Make cards by writing the following or other food items on index cards.

Cod Steak	Frankfurter
Corn Grits	Corn Flakes
Coke	Mustard Greens
Cowpeas	Yoghurt
Prunes	Coffee
Oatmeal	Buttermilk
Butterfinger	Avocados
White Bread	Corn Muffin
Hamburger	Tea
Pot Roast	Pretzels
Goats Milk	Cold Beer
Shredded Wheat	Coffee

LANDFORM SITUMATCH

THIS IS A LEARNING GAME FOR 1 TO 5 PLAYERS. SELECT A LANDFORM YOU ARE TO REPRESENT (LAKE, VALLEY, MOUNTAIN, PLAIN, SHORELINE). PICK A SITUATION THAT MIGHT AFFECT YOU. LIFT UP THE TAB (EACH TAB MAY BE USED ONLY ONCE PER GAME). READ THE RESULTS AND KEEP TRACK OF YOUR POINTS. THE PERSON WHOSE LAST NAME BEGINS CLOSEST TO Z GOES FIRST.

* * * * * * * * * * * * * * * * THE WINNER * * * * * * * * * * * * * * * *

0 - 4 POINTS--------NOT TO BAD
5 - 7 POINTS--------GOOD
8 -10 POINTS--------EXCELLENT
11 -13 POINTS--------SUPER
14 POINTS--------FAR OUT

Earthquake

Causes flooding when lake overflows dam - 1

Blacks a valley with a landslide - 1

Destroys a road on the plain - 1

Landslide

Erodes a mountainside - 1

Creates an earthdam for a lake - 1

Erodes the shoreline - 1

Heavy Rains

Erodes the mountains - 1

Deposits sediments on plains + 3

Cuts back the head of the valley- 1

Glaciers

Leaves Erratics on the plains - 1

Cuts beautiful deep fiords shoreline + 3

Dug & filled the Great Lakes + 3

Radio Active Elements

Causes magma to create volcanic mountains + 3

Causes laccoliths to push up dome mountains + 3

Slow Flowing River

Deposit sandbars in the river valley + 2

Slowly erodes mountains + 2

Deposits sediment for a delta on the shoreline + 2

Paved Roads

Allows for easy crossing of the mountains + 2

Lets us go far into valley to see the beauty of nature + 2

Snow & Ice

Covers lakes for ice skating + 3

Adds water to lakes when ice melts + 3

Covers plains and adds moisture + 3

Fast Flowing River

Erodes valleys - 1

Brings sediment to add to shoreline + 3

Cuts into mountains - 1

Wind

Creates soil erosion on the plain - 1

Makes waves on the lake + 3

Carves unusual forms in soft rocks in the mountains + 2

Uplifting Forces	Cold Winter
Creates moutains + 3	Causes ice to help break up rocks in mountains & valleys + 3 each
Tilts strata on the plains + 3	
Can drain a lake - 1	

Sedimentation	Gravity
Makes lakes shallow - 1	Pulls loosened rocks off valley walls - 1
Makes valleys wider + 2	Causes water to flow in valleys + 3
Increases shoreline formations + 3	Causes mountain sides to erode - 1
Builds up plains + 4	

Situmatch Learning Games

Situmatch is a learning game for 1 to 6 students. Select an organism you are to represent (Oakseed, Euglena, Fern, Mushroom, Bacteria, Pineseed). Pick a situation that is to your advantage. Lift up the tab (each tab may be used only once during a game), read the results and keep track of your total points. The person whose last name begins nearest the letter Z goes first.

* * * * * * * * * * * The Winner * * * * * * * * * * *

0-5 Points-----Not to bad
5-7 Points-----Good
7-11 Points----Very Good
12-15 Points---Excellent
16-19 Points---Super
20-over Points-Far Out

Dog

Furnishes fertilizer for fern, mushroom, bacteria 3pts.

Eats pine and oakseeds -2pts

Cold Winter

Helps trees and ferns by long dormant season. 2pts.

All others no effect. 0pts.

Rain Moist Ground

Helps growth of fern, bacteria, Oak, Pine, Mushroom, Euglenophyta. 3pts.

Spider

Catches insects: helps Oak Pine, fern, Mushroom. 3pts.

No effect on Euglena

Rabbit

Easts Oakseeds, ferns, and Mushrooms. -2pts.

Helps Bacteria 3pts.

No effect on others.

Barefooted Person

Helps Mushrooms like athletes foot. Bacteria and Euglena spread. 3pts.

No effect on others.

Sunny Day

Hurts Bacteria and Mushrooms. -2pts

Helps all others. 3pts

Raccon

Helps spread Euglena by drinking. 3pts

Eats Mushrooms and Oakseeds. -2pts

No effect on others.

Sandy Soil

Better growth for Pine and fern. 3pts

Too dry for mushrooms and Bacteria. -2pts

No effect on others.

High Humidity

Helps Bacteria, fern, muchroom, Eulena grow fast. 3pts

No effect on others.

Woodpecker

Makes holes in Oak and Pine for homes. -2pts

Spreads Euglena when it drinks. 3pts

No effect on others.

Toad

Eats mushrooms. -2pts

Eats insects that help all other. 3pts.

Dry Summer

Hurts all. -2pts.

Low Humidity

Helps Oaks, Pine. 3pts.

Hurts fern, mushroom, Bacteria Euglena. -2pts.

Warm Winter

Hurts trees and ferns by Shorten formant seasons. -2 pts.

No effect on others. 0 pts.

Freshwater Pond

Euglena and Bacteria grows here. 3pts.

Helps ferns and Oak and Pine to get water. 3pts

No help for mushroom.

Frog

Eats Euglena and mushroom -2pts

No effect on others. opts.

Forest Fire

Helps Pine trees seeds break dormancy. 3pts

Hurts by killing Oak, fern, Bacteria, mushroom. -2pts

Lightening

Can kill Pine and Oak and Euglena in water. -2pts

Burn leaves, kill fern, bacteria and mushrooms. -2pts

High Winds

Break limbs of Pine and Oak. -2pts

No effect on others. Opts

Ants

Spread Bacteria and Mushroom spores. 3pts

Kills Pine and Oak trees. -2pts

No effect on others.

Pig

Eats mushrooms, Pine and Oak. -2pts

All others. 2pts

Salt water Pond

Kills All. -2pts

Snow on the ground

Helps Oak, fern, mushrooms seeds to break dormancy. 3pts.

Hurts others. -2pts.

Cloudy Day

Helps fern, Bacteria, mushrooms grow. 3pts.

Hurts all others. -2pts.

Loud Noise

No proven effect on plants. Opts.

Squirrels

Hurts by eating Oak, Pine seeds and muchrooms. -2pts

Spreads Bacteria. 3pts

No effect on others.

Fish

Eats Euglenophyta. -2pts

No effect on others.

15 Biological Feud

by Ron Studdert

4 groups=equal in number

1 person in each group is the moderator

1 person is the contestant

1 group of clue givers 2-8

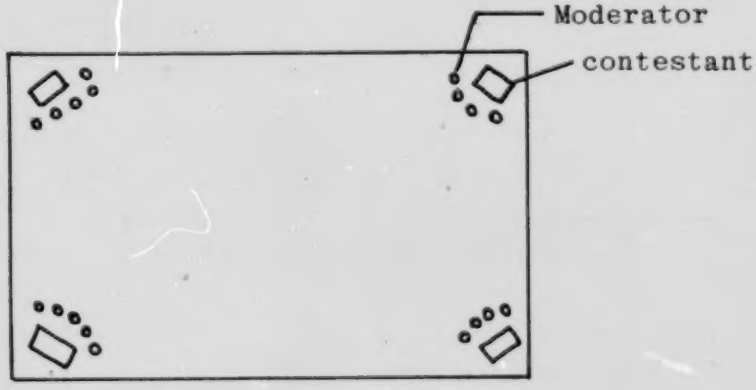
Organism to be identified is given from moderator to clue givers in each group (same word)

Groups begin upon "start" indication to give clues to contestent. Clue givers go in order. 5 seconds to give clue. Contestent must respond to each clue before the next clue giver can give his clue.

Each group works at own rate

1st contestent to get word wins points for himself and 1 point for each member of his group

Contestent becomes clue giver
Clue giver becomes contestent
New word is given and game begins anew



Clues	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Points	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Marine Life Rummy
(2-6 players)

(This game follows the general pattern of Gin Rummy)

Objective: To "meld" 5 cards to describe one animal with one "off" as a discard, thus to associate an animal with its habitat, feeding style, locomotion, description, etc.

Deck: Each deck contains 50 cards including 2 "wild cards" which a player may declare to be any characteristic that will fit into his hand.

Rules: 1) The dealer will be the person whose last name contains the most letters.

2) The dealer will deal 5 cards to all players and 6 to himself. The remainder of "the deck" is placed face down in the center.

3) The dealer begins by discarding one card face up. The player to his left may choose the top discard or draw from the stack. This player discards one card, face up. Continue in this fashion until a player melds.

4) A player melds when five of his cards all describe the same animal. He then declares "Rummy" and shows his cards and names the organism that possesses these characteristics. The player that melds correctly receives a 10 point bonus.

5) The "melder" may be challenged if another player thinks one of his cards does not fit into the description of the designated organism. If the challenger is proved correct he collects the 10 point bonus and the original "meld" is penalized 5 points. The game ends when one player accumulates 50 points."

Marine Life Rummy

(cont.)

The deck will contain the following cards

Number of Cards	Written on Cards
1	Phylum: Chysophyta
2	Phylum: Mollusca
1	Phylum: Protozoan
1	Phylum: Echinodermata
1	Phylum: Arthropoda
4	Habitat: Benthic
2	Habitat: Pelagic
2	Locomotion: Jet Propulsion
1	Locomotion: Crawl
1	Locomotion: Tube Feet
2	Locomotion: Planktonic
1	Feeding: Carnivore
1	Feeding: Filter Feeder
2	Feeding: Ingestion
1	Feeding: Inorganic Nutrient
1	Feeding: Detritus
1	Covering: Skin
1	Covering: Bivalve Shells
1	Covering: Calcareous Test
1	Covering: Siliceous Plates
1	Covering: Leathery Plates
1	Covering: Chitonous Carapace

Marine Life Rummy

(cont.)

Number of Cards	Written on Cards
1	Substrate: Rocky
1	Substrate: Sandy
2	Substrate: Sandy or rocky
3	Euphotic Zone
2	Pelagic
1	Nekton
1	Eight Arms
1	Ten Jointed legs
1	Spiny Skin
1	Pseudo-podia
1	Ring Canal
2	Hides in Rocky Crevice
1	Prefers Warm Water
2	Prefers Cool Water
2	You Name It

Your Time Chart

Develope a mock time scale to show how geolist developed the Geo-legic time scale.

Have each student think of 1 significant event in their life.
Example-recieved their first bicycle
recieved their first shotgun
lost their first tooth
drove car first time

These correlate to significant events in say evolution of animals or formation of land forms. In other words Geologist know these events happened but not when. They fit these events into the already existing time scale, which of course gets better o. more complete with time. Knowledge is built on knowledge. The more pieces that are there, the easier it is to fit in new pieces. Okay, Geologist have the benerit of certain things such as age dating (to help somewhat). We have the benefit of knowing the ages of the people at the present and the probable age they were when their special event took place. Each student states their event, the other students guess the year they think that event happened. Say years range from 1963 to 1976 (for children about 13) First child says he lost his 1st tooth, we'll say it happened when he was 6 so we'll put 1969 (VK,child's initials) on board. And add all of the other childrens events in order the best we can. (Some events may also indicate the season which can also be added.) Later we go back and find out the exact dates of the events to see how close we were.

Much discussion arises in deciding what year many things took place.

MINERAL RUMMY

Katherine Goodbar

MATERIALS:

Deck of 68 tag board cards about 6 cm X 9 cm with a mineral characteristic on each.

Deck of 6 colored tag board cards same size (Player cards). Players are Quartz Orthoclase, calcite, hematite, gypsum, galena.

THE PLAY

Each player draws a player card from the colored deck. During the play he will try to draw characteristics for the mineral that he represents.

Five cards are delt from the deck to each player. The rest of the deck is placed in the center of the table face down with one card placed face up by the side to begin the discard pile. Each player may draw a card from the deck in turn and make a discard. If a card is drawn from the discard pile, the entire discard pile must be taken. When a player has three cards with characteristics of his mineral he may lay them down face up in front of him. A player may play cards on the display that another player has put down. A player may challenge a card that another player has put down. If the challenger is correct, the player must take up the wrong card and take two more cards into his hand from the deck. In order to Rummy a player must play all of the cards in his hand and have a discard. This means that he will probably have to take a discard stack at sometime during the play. At the end of the play each player gets 5 points for each card on the table, Rummy is an additional 20 points, and the person who Rummies gets 1 point for every card that each player has still in his hand.

THE DECK

One of the following characteristics is on each card. Some characteristics are on more than one card:

Silicate	varieties are alabaster and selenite
Found in granite	penny scratches
Hardness of 7	fizzes in acid
Conchoidal fracture	3 directional cleavage
Vitreous luster	calcium carbonate
striated crystals	may be any color
rock forming mineral	may be any color
one variety is chert	tan to white when pure
makes up most beach sand	rhombohedral cleavage
white, gray, pink	rock forming mineral
Specific Gravity 2.6	abundant in Dallas
hardness of 6	chief ore of iron
$KAlSi_3O_8$	oxide mineral

THE DECK (continued)

90^{o} cleavage in 2 directions
vitreous to pearly luster
weathers to clay minerals
found in granite
rock forming mineral
hardness of 2
hydrous clacium sulfate
an evaporite
pearly to silky luster
white to gray when pure
one variety is fibrous
rock forming mineral
gray-silvery color
deposited by hydrothermal solutions
dark gray streak
ore of zinc
hardness of 1
hardness of 5
greasy feel
apple green grains
cleaves in thin sheets
a radioactive mineral

red-brown streak
metallic to earthy luster
specific gravity 5.26 (fairly heavy)
hardness 5.5 - 6.5
color redish brown to black
kidney ore
weathers to limonite
ore of lead
cubic cleavage
metallic luster
specific gravity 7.5 (heavy)
hardness 2.5
used in the manufacture of bullets
sulfide mineral

cleavage in 4 directions
ore of copper
hardness of 4
hardness of 8
dark purple color
yellow streak
an amphibole
used in making wall board

Clues to "Who Are You"

Class is divided into 2 groups seated in rows or other arrangement.

Clues are read by teacher or student.

Student #1 in each group has a chance to name 1 organism on first clue, if named on first clue the team gets 5 points. Each clue read decreases possible score by 1 point. If no team gets answer, go on to next organism.

Animals to Guess

1. Frog
   a. fresh water dweller
   b. aniphibian
   c. eyes help swallow
   d. boys croak
   e. looks like a toad

2. Rabbit
   a. land dweller
   b. mammal
   c. viviparous
   d. has long ears
   e. delivers eggs at Easter

3. Lemming
   a. tundra dweller
   b. mammal
   c. jumps off cliff when crowded
   d. looks like a rat
   e. rhymns with swimming

4. Prairie Dog
   a. desert dweller
   b. mammal
   c. can stand very high body temperature
   d. has a cousin in the forest
   e. lives in a "town"

5. Pine tree
   a. Lives in the forest
   b. Gymnosperm
   c. Conifer
   d. has needles
   e. we decorate it at Christmas

6. Pecan tree
   a. lives in the forest
   b. Angiosperm
   c. "nut bearer"
   d. deciduous
   e. Texas state tree

Art Project

Take leaf (any type) use to make a body of head of person. Paste to construction paper. Add remaining parts of body. Color in background.

125

FREE MATERIALS AVAILABLE

Forests and Forestry

13210. Write for publications list showing 67 popular and technical forestry publications. Free to teachers. Sample titles are:

Recipe for Tree Planting. 6 pp. Hints for the best way to plant a tree.

The Story of Your Christmas Tree. Rev. 1968. 6 pp. Christmas related story.

Tree Pest Leaflet Series. Rev. 1968. Twenty-two leaflets covering tree pests and diseases of New York State.

When You Are in the Woods. Rev. 1967. 42 pp. Tells how to enjoy forests.

The Forest and Our Environment. National Forest Products Assoc. 1619 Massachusetts Ave., N. W. Washington, D. C. 20036. 1970. 14 pp. Free. Discusses the environmental benefits of growing forests and the need for a balance in forests and their use.

Handbook on Conifers. Brooklyn Botanic Garden. 1000 Washington Ave. Brooklyn, N. Y. 11225. 1969. 105 pp. $1.50. Lists most satisfactory conifers for each region, discusses how to protect them from insects and disease, and provides buying information on many varieties.

Lumber and Wood Products Literature. National Forest Products Assoc. 1619 Massachusetts Ave., N. W. Washington, D. C. 20036. 1970. 32 pp. Free. A bibliography of informative literature and audio-visual materials dealing with forestry and wood products.

Papermaking. Hammermill Paper Co. P. O. Box 1440. Erie, Pa. 16512. Titles include:

From Forest Tree to Fine Papers. 1970. Leaflet. Free. Illustrates Process of papermaking.

How to Make Paper by Hand. 1-10 copies 25 cents each; 11 or more copies 15 cents each. A kit containing full instructions for making paper by hand.

Redwoods. Redwood Region Conservation Council. Rosenberg Bldg. Santa Rosa, Calif. 95404. A variety of materials on forestry, conservation, and general information on redwood trees is available free to teachers.

The Redwoods. Federal Reserve Bank of San Francisco. Administrative Services Dept. 400 Sansome St. San Francisco, Calif. 94120. 1969. 12 pp. Free. Study of the redwoods along California's northern coast.

The Southern Hardwoods. 67 pp. 25 cents. Descriptions of southern hardwoods, their characteristics, availability, and use.

Southern Pine. Southern Forest Products Assoc. P. O. Box 52468. New Orleans, La. 70150. Titles include:

The Southern Pine Story. 16 pp. Free. Tells of the many uses of the southern pine.

The South's Third Forest. 11 pp. Free. Discusses plans for growing a new forest of trees to meet the needs of the future.

Ten Lessons in Forestry. 55 pp. Free. Gives lesson plans, suggested activities, and a list of sources.

Teachers Packet. Western Wood Products Assoc. 700 Yeon Bldg. Portland, Ore. 97204. Sample title:

Our Forests and You. 1970. Single packet free to teachers. A selection of materials about forests, forest management, recreation, and various types of trees.

Trees. Southern Forest Institute. Suite 280. 1 Corporate Square, N. E. Atlanta, Ga. 30329. Single copy free. Sample titles are:

How Paper Comes From Trees. 14 pp. Tells about paper and other paper products.

Your Fabulous Friend. 14 pp. Brief story of how wood products are used every day in many ways.

FORESTS AND FORESTRY---See also: Conservation; National Parks and Monuments; Natural Resources; Nature.

California Redwood. California Redwood Assoc. 617 Montgomery St. San Francisco, Calif. 94111. Single copy free to teachers. Titles include:

Our Redwood Heritage. 12 pp. Fully illustrated comprehensive account of the coast redwood.

Teacher's Kit. Includes brochures, paperback book, booklets, posters, and data sheets about the coast redwood.

Fine Hardwoods. Fine Hardwoods Assoc. 666 Lake Shore Dr. Chicago, Ill. 60611. 1-9 copies free; 10 or more copies 10 cents each. Titles include:

Fine Furniture Woods. 24 pp. Facts about walnut, mahogany, cherry, maple, birch, oak, and some exotic species of furniture woods.

Hardwood Veneers for Architectural Interiors. 11 pp. Summarizes important factors for selection of hardwood plywood.

Forestry. American Forest Institute. 1619 Massachusetts Ave., N. W. Washington, D. C. 20036. Distributed in the United States only. Send for price list for additional copies above the free quantity. Publications on good forestry practice. Sample titles are:

Better Management Vital to Improved Timber Supply. 1970. 15 pp. Free. Discusses the problems of a stable timber supply.

Forests and Trees of the United States. Rev. 1971. Map 25" x 35". In color. Also 8-page teaching suggestions. Single copy free to teachers.

The Story of Pulp and Paper. Rev. 1969. 16 pp. Five copies free per teacher.

Forestry Activities: A Guide for Youth Group Leaders. (A1.68:457/2). Supt. of Documents. Gov't. Printing Office. Washington, D. C. 20402. 1966. 31 pp. 20 cents. Projects for all ages and types of groups.

Organism Interaction

Enclosed is a set of drawings for your use in developing student concepts and knowlege of animal interaction.

In order to acquaint students with the card you could cut out the drawings and place them on display.

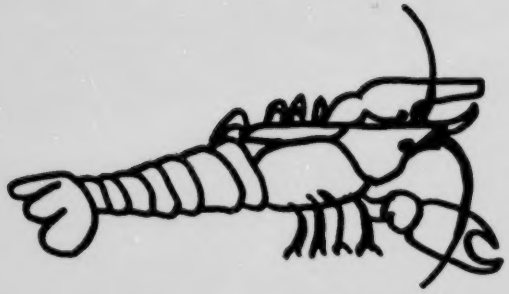
A student activity would be to have the children sit in a circle, give each one a card. Each child is to then represent that animal. Asking questions about the animals life style as you go have the students hold on to a string. If you use two colors of string one for plant eaters and one for meat eaters the illustration of the food web is more dramatic. The students holding two strings are then easier to identify as being adaptable to a wide range of food choices.

You may now wish to use the Who Am I activity on the back of this page.

Educational Personnel Development
Consortium D
P.O. Box 1300
Richardson, Texas 75080

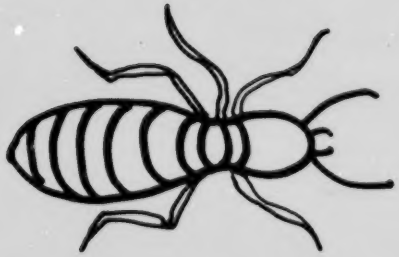
Project ESP grant # G007601990

Crayfish



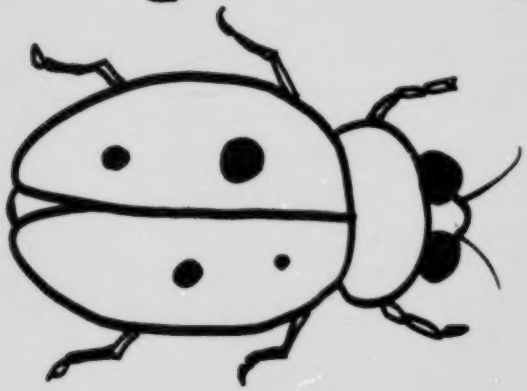
Squirrel

Termite



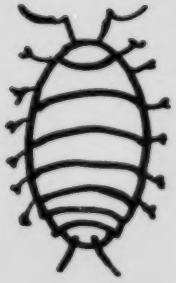
Dragonfly

Ladybug

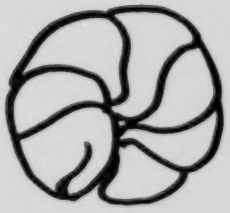


Snake

Sow Bug



Pill Bug



Ant

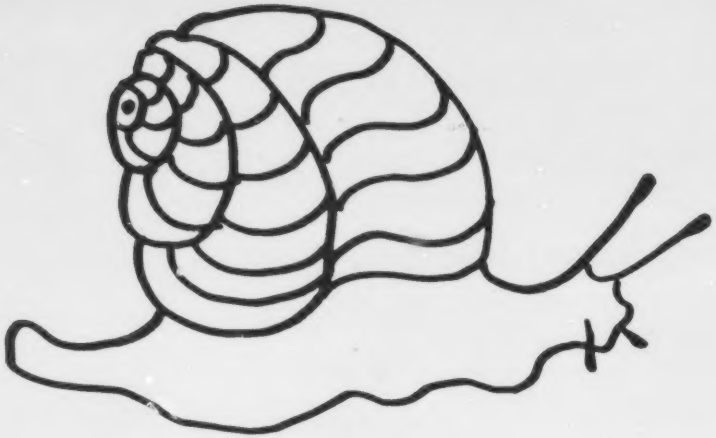
Earthworm

Cat

Rabbit

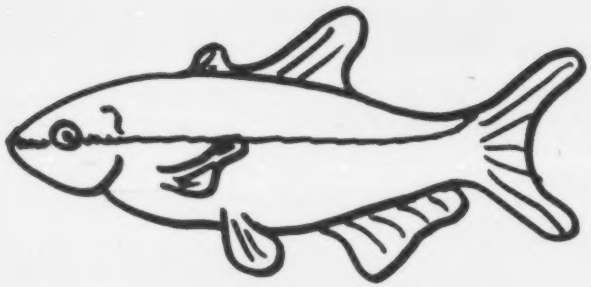
Bird

Snail

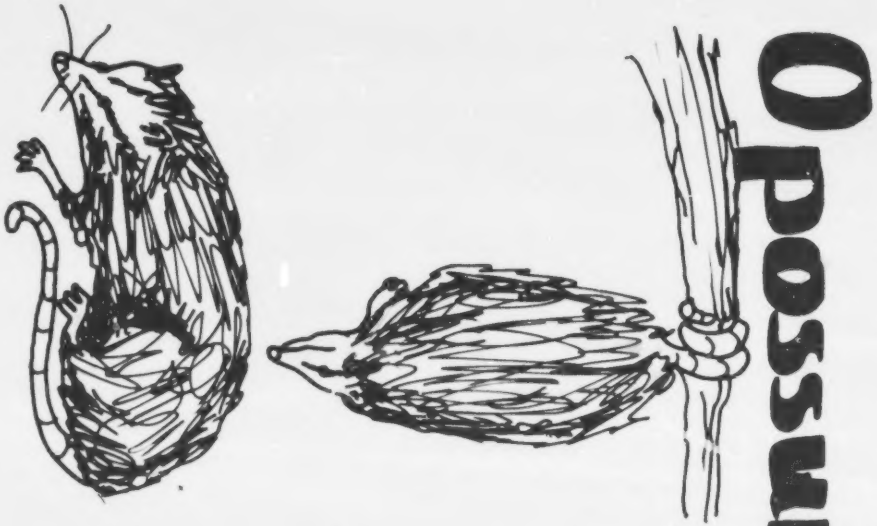


Raccoon

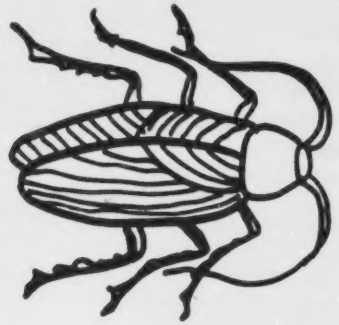
Fish



Opossum



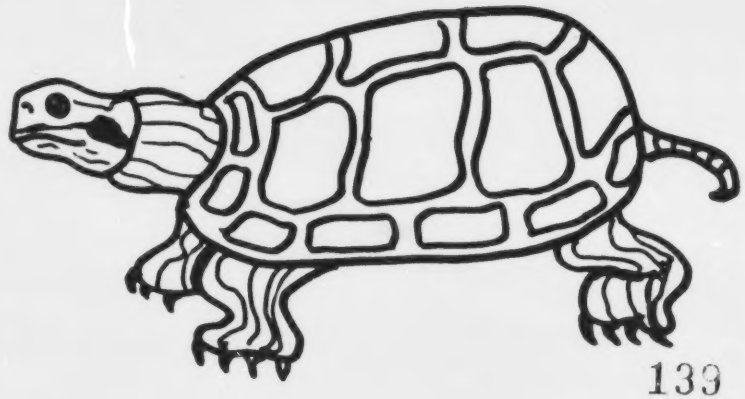
Cockroach



Eagle

Mouse

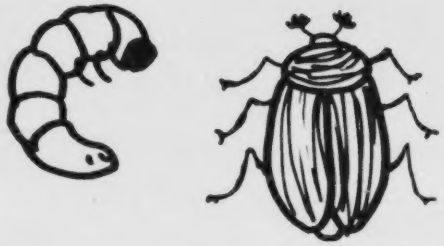
Turtle



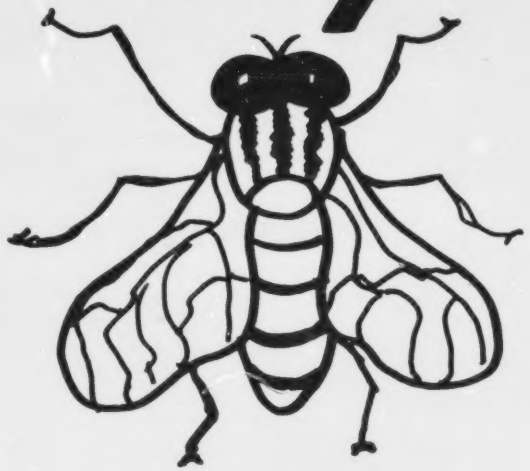
Porcupine

Lizard

June bug



Fly



Wolf

Horse

Me

Owl

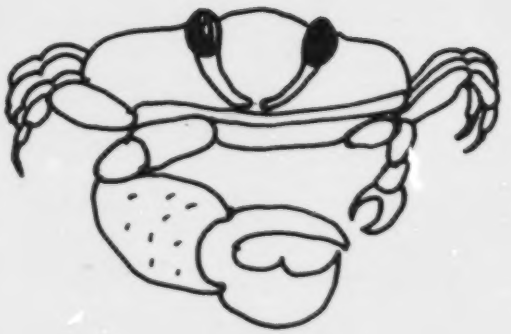
Me

Praying

Mantis

Bat

Crab

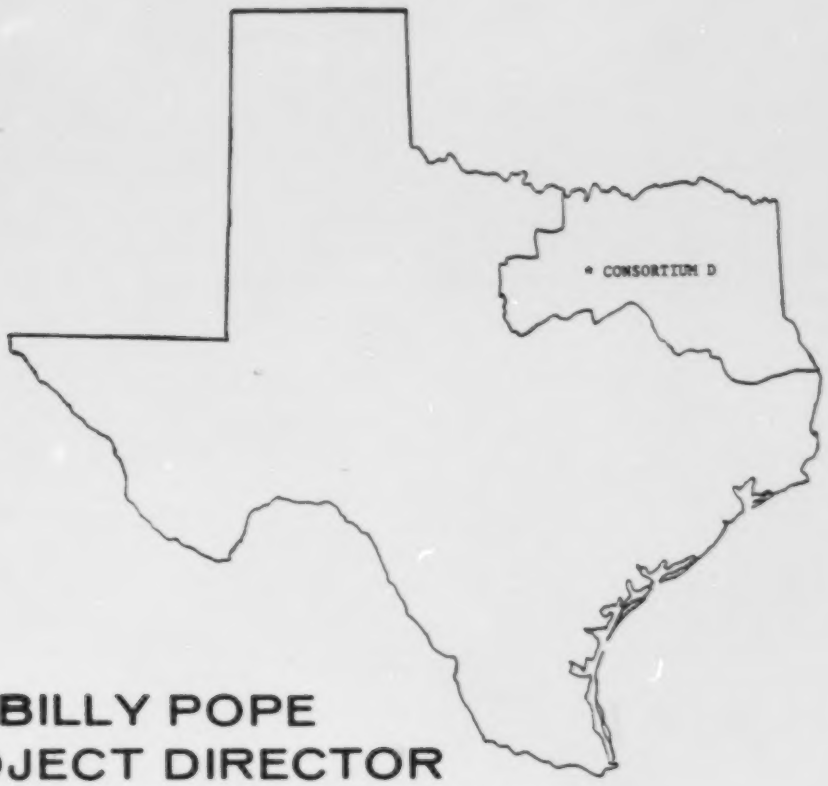


Butterfly

Grasshopper

Duck

Frog



DR. BILLY POPE
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RICHARDSON, TEXAS 75080

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Appendix C

G007601990

Appendix C

ERIC CLEARINGHOUSE FOR SCIENCE, MATHEMATICS, & ENVIRONMENTAL EDUCATION

The Ohio State University, Columbus, Ohio

DOCUMENT ACKNOWLEDGEMENT FORM

Thank you for your contribution of documents to the ERIC Clearinghouse for Science, Mathematics, & Environmental Education. The documents have been reviewed by our professional staff on the basis of their potential usefulness to others, both in terms of individual merit and in relation to existing documents in the ERIC/SE collection. Their disposition is as follows:

TITLE "Activities in Environmental Education."

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Appendix D

Appendix D
Inventory A

Post Instrument May, 1977

Directions

Read each item and mark the answer which you believe provides the best answer to the question or the statement on the answer sheet provided. (If you are not provided with an answer sheet, mark your answer on the inventory in the space provided.)

1. Land use in the U.S. is shifting from

___ (a) urban to rural
___ (b) rural to suburban
___ (c) suburban to urban
___ (d) suburban to rural

2. Research and technical break-throughs have demonstrated that energy can be obtained on a large scale from which of the following sources?

___ (a) solar energy
___ (b) tidal flow
___ (c) geothermal sources
___ (d) wind power

3. The U.S. population is growing at a rate which is

___ (a) less than that of most of the rest of the world
___ (b) at about the same rate as that of most of the rest of the world
___ (c) at a rate more rapid than that of most of the rest of the world

4. Wastes from nuclear power plants which are high in radioactivity are currently

___ (a) lost into the air
___ (b) discharged into water sources such as rivers and lakes
___ (c) concentrated and stored in liquid form
___ (d) concentrated and stored in solid form

5. Most of the radiation to which the average American is exposed is due to

___ (a) Solar sources
___ (b) TV sets and luminous wrist watches
___ (c) medical sources (X-rays, etc.)
___ (d) Atomic bombs and nuclear power plants.

6. Once DDT has been spread to kill pests it

___ (a) remains active for a few weeks only

___ (b) remains active for one or two years

___ (c) remains active for many years

___ (d) remains active for ever

7. Death in the United States due to lung cancer is greatest in

___ (a) rural areas
___ (b) cities of less than 250,000 people
___ (c) cities of 250,000 to 1,000,000
___ (d) cities over 1,000,000

8. At today's rate of consumption known reserves of zinc, lead, tin, petroleum, and copper will be depleted in

___ (a) 10 years
___ (b) 50 years
___ (c) 100 years
___ (d) 200 years

9. Industry is responsible for what percent of the water pollution?

___ (a) 95%
___ (b) 65%
___ (c) 45%
___ (d) 25%

10. The Environmental Protection Agency estimates that industry can currently remove what percent of pollution discharged into water

___ (a) 100%
___ (b) 85%
___ (c) 65%
___ (d) 50%

11. North Americans are removing fresh water from underground sources

___ (a) not accurately known
___ (b) less than the repacement rate
___ (c) about equal to replacement rate
___ (d) more than the replacement rate

12. The major cause of death in the 18-24 age group is

___ (a) suicide
___ (b) auto accidents
___ (c) sickness and disease
___ (d) drugs

13. The non-medical use of drugs in the U.S. is

___ (a) increasing
___ (b) about constant
___ (c) decreasing but receiving more publicity
___ (d) decreasing

14. The greatest amount of air pollution in developed countries comes from

___ (a) cars, buses, trains, planes etc
___ (b) industry
___ (c) burning solid wastes
___ (d) homes

15. The major air pollutant discharged into the air by weight is

___ (a) nitrogen oxide
___ (b) sulfur oxide
___ (c) particulates
___ (d) carbon monoxide

16. Where do you believe we have the areas of worst pollution and ugliest construction?

___ (a) cities
___ (b) suburbs
___ (c) villages
___ (d) rural areas

17. Non-medicinal use of drugs would decline if we

___ (a) passed and enforced stricter laws
___ (b) made the use of drugs legal
___ (c) enforced present laws
___ (d) none of the above

18. Injuries caused by accidents are the leading cause of death in which of the following age groups?

___ (a) 1 through 30
___ (b) 30 through 60
___ (c) over 60 years
___ (d) all of these

19. Research data indicate that physiological hearing damage begins at an exposure to

___ (a) 40 declibels
___ (b) 85 decibels
___ (c) 120 decibels
___ (d) 210 decibels

20. Most of the phosphates which reach the oceans come from

___ (a) local cities
___ (b) industrial sources
___ (c) farms
___ (d) boats

21. An inversion can be harmful because it

___ (a) puts more carbon dioxide into the air
___ (b) keeps pollution near the ground
___ (c) cuts down on horizontal air flow
___ (d) produces pollutant particles

Directions

Read each item and mark the answer which you believe provides the best answer to the question or the statement on the answer sheet provided. (If you are not provided with an answer sheet, mark your answer on the inventory in the space provided.)

22. Living things are interdependent with one another and with their environment.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

23. Man has affected environmental processes in a negative way.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

24. Increased population mobility is changing the nature of demands upon some resources.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

25. Outdoor recreation is an increasingly important part of our culture and our economy.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

26. Choices between human needs (essentials) and human wants or desires (nonessentials) must be considered if we are to improve our quality of life.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

27. In any environment, one component like water, air, or food may limit the type of life which can survive.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

28. Organisms and environments are in constant change.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

29. Man has responsibility to develop an appreciation of and respect for the rights of others.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

30. Only strong governmental controls will reduce pollution problems.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

31. Each parent is currently allowed to deduct several hundred dollars from their taxable income for each child in their family. I would vote

___ (1) increase the tax exemption (allowance) per child
___ (2) decrease the tax exemption (allowance) per child
___ (3) leave the tax exemption (allowance) per child as it is

32. Which of the following problems is most serious in your community?

___ (1) air pollution
___ (2) water pollution
___ (3) solid waste disposal
___ (4) land use

33. Which of the following problems is most serious in your community?

___ (1) pollution problems
___ (2) land use
___ (3) crime
___ (4) traffic accidents

34. Which of the following problems is most serious in your community?

___ (1) pollution problems and land use
___ (2) crime
___ (3) health problems
___ (4) traffic accidents

35. An individual has too much power in determining the way he lives.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

36. Farmers are generally more concerned about environmental problems than are people who live in the suburbs.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

37. People who live in the suburbs generally are more concerned about environmental problems than are people who live in the inner city.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

38. It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

40. Industries should not be allowed to contribute to pollution - either through production or with the end product.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

Controls should be placed on industry which will protect the environment even if it means things will cost more.
__(1) Agree __(2) Neutral __(3) Disagree __(4) No Opinion

Appendix E

Appendix E

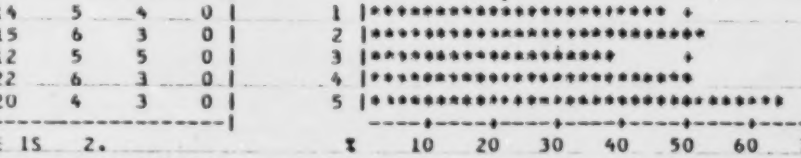
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

THE VERTICAL LINE FORMED BY A PLUS SIGN (+) ON THE FOLLOWING GRAPHS IS THE REPRESENTATION OF THE MEAN DIFFICULTY (PROPORTION CORRECT) FOR THAT ITEM. GROUP 1 IS THE LOWEST PREFORMING GROUP, GROUP 5 IS THE HIGH PREFORMING GROUP. THE BAR GRAPH REPRESENTS THE % OF EACH GROUP WHICH ANSWERED THE ITEM CORRECTLY.

ITEM NUMBER 1
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	7	14	5	4	0
2	0	5	15	6	3	0
3	0	9	12	5	5	0
4	0	13	22	6	3	0
5	0	4	20	4	3	0

CORRECT RESPONSE CURVE.



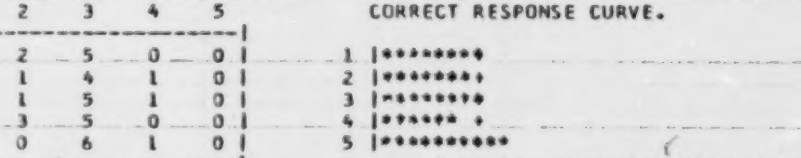
CORRECT RESPONSE IS 2. DIFFICULTY = 50.30

1. Land use in the U.S. is shifting from
   (a) urban to rural
   (b) rural to suburban
   (c) suburban to urban
   (d) suburban to rural

ITEM NUMBER 2
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	23	2	5	0	0
2	0	23	1	4	1	0
3	0	24	1	5	1	0
4	0	36	3	5	0	0
5	0	24	0	6	1	0

CORRECT RESPONSE CURVE.



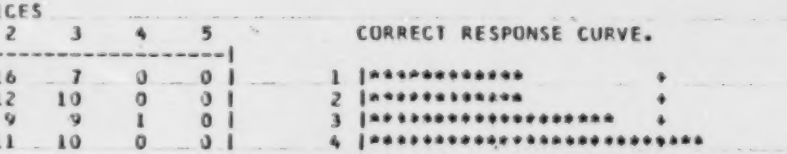
CORRECT RESPONSE IS 3. DIFFICULTY = 15.15

2. Research and technical break-throughs have demonstrated that energy can be obtained on a large scale from which of the following sources?
   (a) solar energy
   (b) tidal flow
   (c) geothermal sources
   (d) wind power

ITEM NUMBER 3
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	7	16	7	0	0
2	0	7	12	10	0	0
3	0	12	9	9	1	0
4	0	23	11	10	0	0
5	0	27	1	3	0	0

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 46.06

3. The U.S. population is growing at a rate which is
   (a) less than that of most of the rest of the world
   (b) at about the same rate as that of most of the rest of the world
   (c) at a rate more rapid than that of most of the rest of the world

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ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

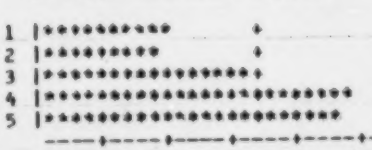
ITEM NUMBER 4
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	4	11	9	6	0
2	0	7	11	6	5	0
3	0	2	14	5	10	0
4	0	4	10	9	21	0
5	0	0	7	8	14	2

CHOICES

CORRECT RESPONSE IS 4.

CORRECT RESPONSE CURVE.



4. Wastes from nuclear power plants which are high in radioactivity are currently

(a) lost into the air
(b) discharged into water sources such as rivers and lakes
(c) concentrated and stored in liquid form
(d) concentrated and stored in solid form

DIFFICULTY = 33.94

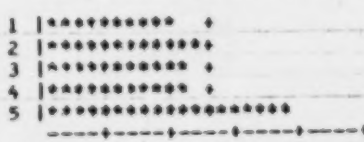
ITEM NUMBER 5
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	10	9	6	4	0
2	0	9	10	7	2	1
3	0	6	16	7	2	0
4	0	11	20	10	3	0
5	0	11	7	12	1	0

CHOICES

CORRECT RESPONSE IS 3.

CORRECT RESPONSE CURVE.



5. Most of the radiation to which the average American is exposed is due to

(a)
(b) TV sets and luminous wrist watches
(c) medical sources (X-rays, etc.)
(d)

DIFFICULTY = 25.45

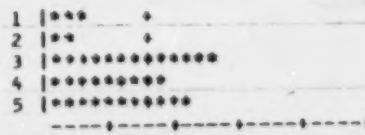
ITEM NUMBER 6
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	11	8	9	2	0
2	0	13	8	6	1	1
3	0	7	9	7	8	0
4	0	10	10	15	8	1
5	0	5	4	15	7	0

CHOICES

CORRECT RESPONSE IS 4.

CORRECT RESPONSE CURVE.



6. Once DDT has been spread to kill pests it

(a) remains active for a few weeks only
(b) remains active for one or two years
(c) remains active for many years
(d) remains active for ever

DIFFICULTY = 15.76

161

162

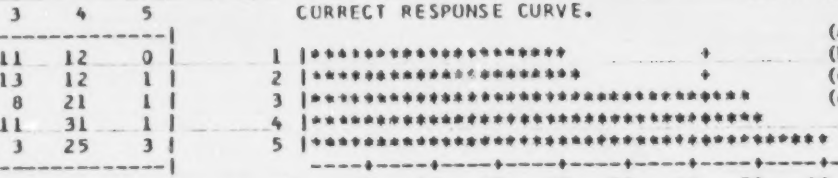
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 7
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	2	5	11	12	0
2	0	0	3	13	12	1
3	0	1	0	8	21	1
4	0	0	1	11	31	1
5	0	0	0	3	25	3

CORRECT RESPONSE IS 4.

CORRECT RESPONSE CURVE.



7. Death in the United States due to lung cancer is greatest in

(a) rural areas
(b) cities of less than 250,000 people
(c) cities of 250,000 to 1,000,000
(d) cities over 1,000,000

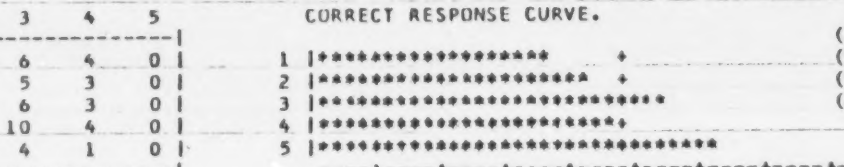
DIFFICULTY = 61.21

ITEM NUMBER 8
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	9	11	6	4	0
2	0	9	12	5	3	0
3	0	5	17	6	3	0
4	0	10	20	10	4	0
5	0	7	19	4	1	0

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



8. At today's rate of consumption known reserves of zinc, lead, tin, petroleum, and copper will be depleted in

(a) 10 years
(b) 50 years
(c) 100 years
(d) 200 years

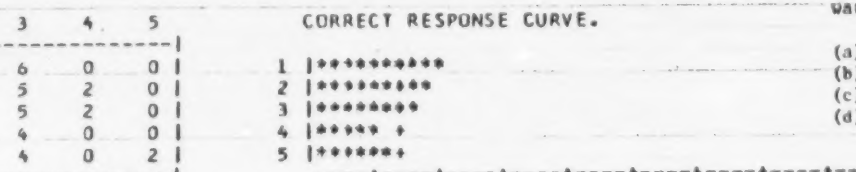
DIFFICULTY = 47.88

ITEM NUMBER 9
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	10	14	6	0	0
2	0	7	15	5	2	0
3	0	11	13	5	2	0
4	0	15	25	4	0	0
5	0	7	16	4	0	2

CORRECT RESPONSE IS 3.

CORRECT RESPONSE CURVE.



9. Industry is responsible for what percent of the water pollution?

(a) 95%
(b) 65%
(c) 45%
(d) 25%

DIFFICULTY = 14.55

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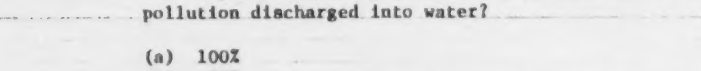
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 10
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	5	11	6	6	2
2	0	2	8	8	10	1
3	0	1	11	8	11	0
4	0	1	18	6	18	1
5	0	4	13	5	9	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 4. DIFFICULTY = 32.73

10. The Environmental Protection Agency estimates that industry can currently remove what percent of pollution discharged into water?

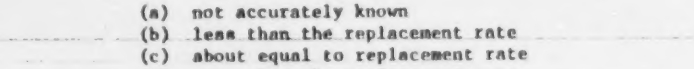
(a) 100%
(b) 85%
(c) 65%
(d) 50%

ITEM NUMBER 11
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	6	8	9	6	1
2	0	5	10	6	7	1
3	0	6	10	8	6	1
4	0	9	17	9	9	0
5	0	2	8	3	18	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 4. DIFFICULTY = 27.88

11. North Americans are removing fresh water from underground sources

(a) not accurately known
(b) less than the replacement rate
(c) about equal to replacement rate
(d) more than the replacement rate

ITEM NUMBER 12
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	5	14	4	7	0
2	0	7	11	2	9	0
3	0	7	16	1	7	0
4	0	2	32	5	5	0
5	0	1	28	0	1	1

CHOICES

CORRECT RESPONSE CURVE.

CORRECT RESPONSE IS 2. DIFFICULTY = 61.21

12. The major cause of death in the 18-24 age group is

(a) suicide
(b) auto accidents
(c) sickness and disease
(d) drugs

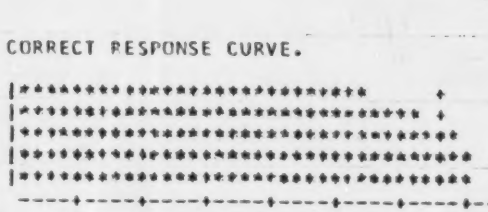
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 13
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	16	8	5	1	0
2	0	18	7	4	0	0
3	0	21	2	5	3	0
4	0	31	7	3	3	0
5	0	22	3	3	3	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



13. The non-medical use of drugs in the U.S. is

(a) increasing
(b) about constant
(c) decreasing but receiving more publicity
(d) decreasing

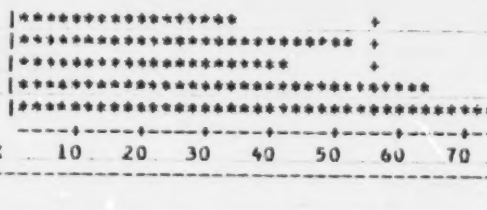
DIFFICULTY = 65.45

ITEM NUMBER 14
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	10	12	4	2	2
2	0	15	12	2	0	0
3	0	13	17	1	0	0
4	0	28	13	3	0	0
5	0	25	5	1	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



14. The greatest amount of air pollution in developed countries comes from

(a) cars, buses, trains, planes, etc.
(b) industry
(c) burning solid wastes
(d) homes

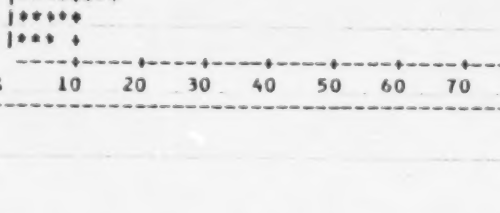
DIFFICULTY = 55.15

ITEM NUMBER 15
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	1	3	5	5	15	1
2	0	1	6	4	17	1
3	0	5	8	1	16	1
4	0	4	10	4	25	1
5	0	2	6	5	18	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



15. The major air pollutant discharged into the air by weight is

(a) nitrogen oxide
(b) sulfur oxide
(c) particulates
(d) carbon monoxide

DIFFICULTY = 9.09

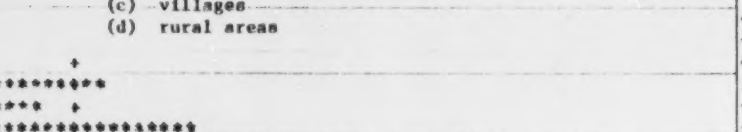
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 16
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	12	6	5	6	0
2	0	23	2	3	1	0
3	0	22	4	0	5	0
4	0	41	2	0	1	0
5	0	28	0	1	2	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 76.36

16. Where do you believe we have the areas of worst pollution and ugliest construction?

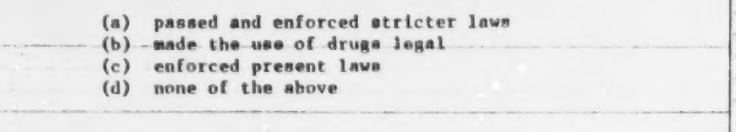
(a) cities
(b) suburbs
(c) villages
(d) rural areas

ITEM NUMBER 17
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	7	9	5	6	2
2	0	7	11	3	8	0
3	0	10	2	9	8	2
4	0	21	5	5	12	1
5	0	5	6	4	15	1

CORRECT RESPONSE IS 4.

CORRECT RESPONSE CURVE.



DIFFICULTY = 29.70

17. Non-medicinal use of drugs would decline if we

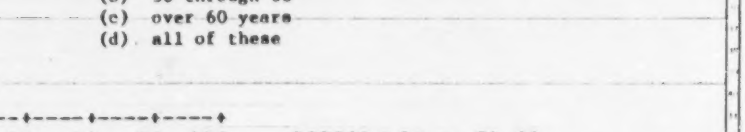
(a) passed and enforced stricter laws
(b) made the use of drugs legal
(c) enforced present laws
(d) none of the above

ITEM NUMBER 18
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	6	9	5	10	0
2	0	17	4	2	6	0
3	0	14	4	1	11	1
4	0	28	4	5	7	0
5	0	20	3	0	7	1

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 51.52

18. Injuries caused by accidents are the leading cause of death in which of the following age groups?

(a) 1 through 30
(b) 30 through 60
(c) over 60 years
(d) all of these

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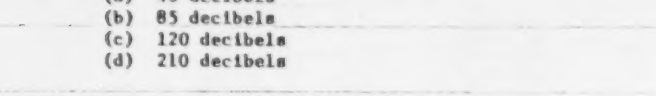
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 19
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	2	1	10	14	3	0
2	0	3	12	8	6	0
3	0	7	10	12	1	1
4	0	6	18	17	3	0
5	0	4	18	9	0	0

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 41.21

19. Research data indicate that physiological hearing damage begins at an exposure to

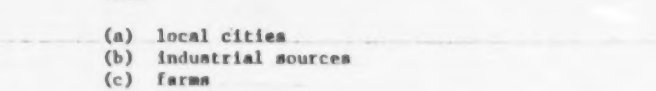
(a) 40 decibels
(b) 85 decibels
(c) 120 decibels
(d) 210 decibels

ITEM NUMBER 20
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	5	17	2	6	0
2	0	8	20	1	0	0
3	0	7	21	1	2	0
4	0	8	32	0	4	0
5	0	12	18	1	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 24.24

20. Most of the phosphates which reach the oceans come from

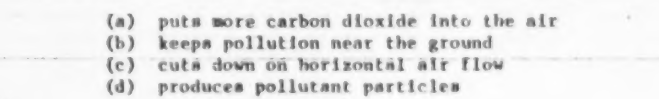
(a) local cities
(b) industrial sources
(c) farms
(d) boats

ITEM NUMBER 21
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	5	10	8	7	0
2	0	9	8	9	3	0
3	0	2	16	9	4	0
4	0	7	29	5	3	0
5	0	3	23	3	2	0

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 52.12

21. An inversion can be harmful because it

(a) puts more carbon dioxide into the air
(b) keeps pollution near the ground
(c) cuts down on horizontal air flow
(d) produces pollutant particles

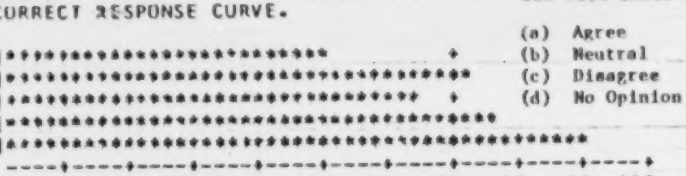
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 22
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	15	5	6	4	0
2	0	21	4	2	2	0
3	0	20	6	4	1	0
4	0	33	4	5	2	0
5	0	28	1	2	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



22. Living things are interdependent with one another and with their environment.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

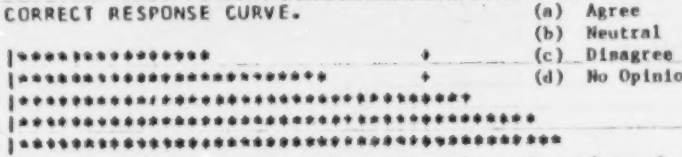
DIFFICULTY = 70.91

ITEM NUMBER 23
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	9	12	7	2	0
2	0	14	10	3	2	0
3	0	22	5	3	1	0
4	0	35	4	5	0	0
5	0	26	5	0	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



23. Man has affected environmental processes in a negative way.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

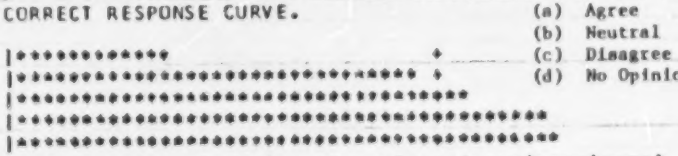
DIFFICULTY = 64.24

ITEM NUMBER 24
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	7	9	3	9	2
2	0	18	5	1	5	0
3	0	22	3	3	3	0
4	0	36	3	0	5	0
5	0	26	3	1	1	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



24. Increased population mobility is changing the nature of demands upon some resources.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

DIFFICULTY = 66.06

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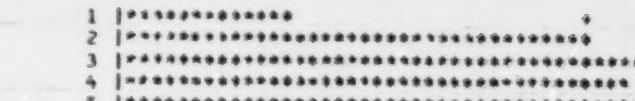
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 25
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	8	8	4	9	1
2	0	21	5	3	0	0
3	0	27	3	1	0	0
4	0	34	6	3	1	0
5	0	28	1	1	1	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



25. Outdoor recreation is an increasingly important part of our culture and our economy

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

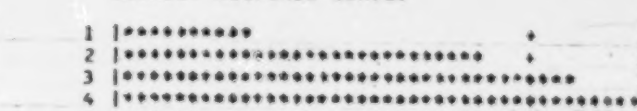
DIFFICULTY = 71.52

ITEM NUMBER 26
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	6	7	12	4	1
2	0	16	4	5	4	0
3	0	22	4	4	1	0
4	0	36	4	2	2	0
5	0	27	3	1	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



26. Choices between human needs (essentials) and human wants or desires (nonessentials) must be considered if we are to improve our quality of life.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

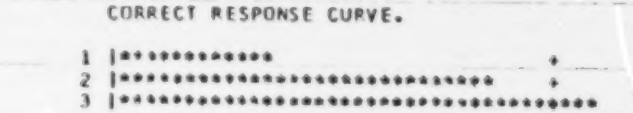
DIFFICULTY = 64.85

ITEM NUMBER 27
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	7	10	7	5	1
2	0	17	7	2	3	0
3	0	23	3	2	3	0
4	0	35	5	2	2	0
5	0	30	1	0	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



27. In any environment, one component like water, air, or food may limit the type of life which can survive.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

DIFFICULTY = 67.88

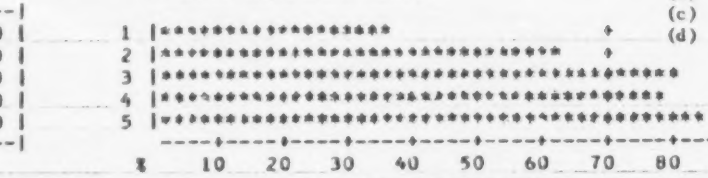
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 28
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	11	11	4	4	0
2	0	18	8	0	3	0
3	0	25	3	3	0	0
4	0	34	5	3	2	0
5	0	26	2	3	0	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 69.09

28. Organisms and environments are in constant change.

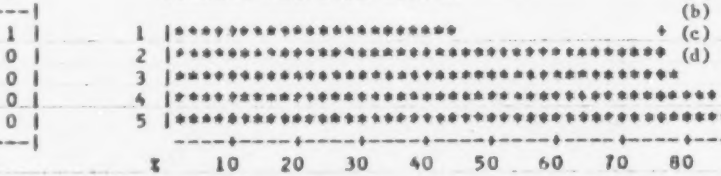
(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

ITEM NUMBER 29
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	13	4	5	6	1
2	0	22	4	2	1	0
3	1	24	4	0	2	0
4	0	37	6	1	0	0
5	0	29	1	0	1	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 75.76

29. Man has responsibility to develop an appreciation of and respect for the rights of others.

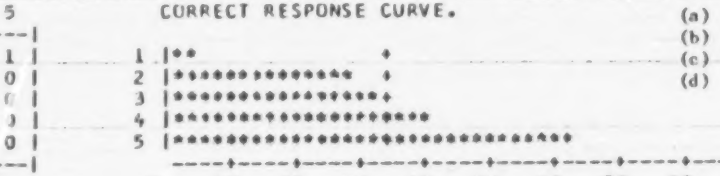
(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

ITEM NUMBER 30
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	1	6	15	6	1
2	0	8	11	9	1	0
3	0	10	8	12	1	0
4	0	18	6	16	4	0
5	0	19	1	11	0	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 33.94

30. Only strong governmental controls will reduce pollution problems.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

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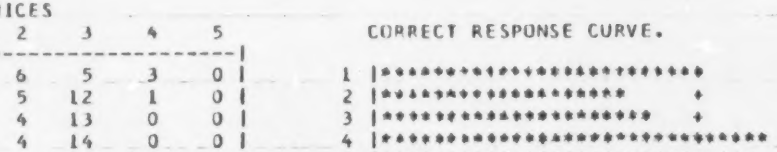
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 31
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	1	15	6	5	3	0
2	0	11	5	12	1	0
3	1	13	4	13	0	0
4	0	26	4	14	0	0
5	0	18	2	10	1	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 50.30

31. Each parent is currently allowed to deduct several hundred dollars from their taxable income for each child in their family. I would vote

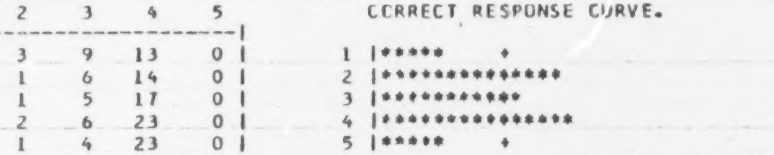
(1) increase the tax exemption (allowance) per child
(2) decrease the tax exemption (allowance) per child
(3) leave the tax exemption (allowance) per child as it is
(4) leave the tax exemption (allowance) per child as it is

ITEM NUMBER 32
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	2	3	3	9	13	0
2	0	8	1	6	14	0
3	1	7	1	5	17	0
4	0	13	2	6	23	0
5	0	3	1	4	23	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 1. DIFFICULTY = 20.61

32. Which of the following problems is most serious in your community?

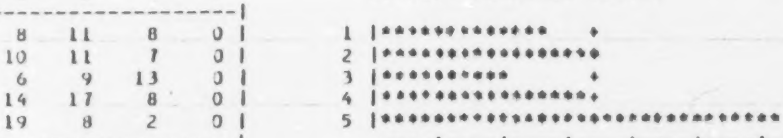
(1) air pollution
(2) water pollution
(3) solid waste disposal
(4) land use

ITEM NUMBER 33
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	3	8	11	8	0
2	0	1	10	11	7	0
3	1	2	6	9	13	0
4	0	5	14	17	8	0
5	0	2	19	8	2	0

CHOICES

CORRECT RESPONSE CURVE.



CORRECT RESPONSE IS 2. DIFFICULTY = 34.55

33. Which of the following problems is most serious in your community?

(1) pollution problems
(2) land use
(3) crime
(4) traffic accidents

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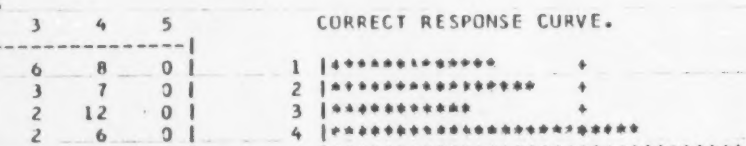
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 34
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	1	8	7	6	8	0
2	0	9	10	3	7	0
3	1	7	9	2	12	0
4	0	21	15	2	6	0
5	0	20	8	1	2	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 39.39

34. Which of the following problems is most serious in your community?

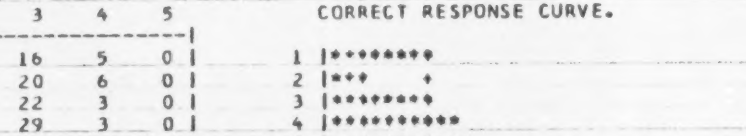
(1) pollution problems and land use
(2) crime
(3) health problems
(4) traffic accidents

ITEM NUMBER 35
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	1	3	5	16	5	0
2	0	1	2	20	6	0
3	0	1	5	22	3	0
4	0	3	9	29	3	0
5	0	1	7	23	0	0

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 16.97

35. An individual has too much power in determining the way he lives.

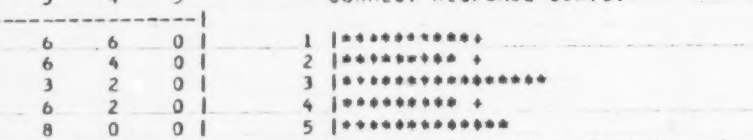
(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

ITEM NUMBER 36
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	0	12	6	6	6	0
2	0	14	5	6	4	0
3	0	16	10	3	2	0
4	0	28	8	6	2	0
5	0	15	8	8	0	0

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 22.42

36. Farmers are generally more concerned about environmental problems than are people who live in the suburbs.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

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ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

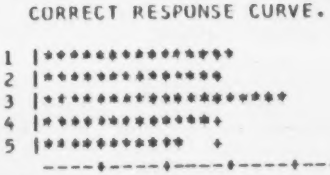
ITEM NUMBER 37
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	5	9	8	8	0
2	0	10	8	8	3	0
3	0	13	12	5	1	0
4	0	17	11	9	7	0
5	0	15	7	8	1	0

CHOICES

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 28.48

37. People who live in the suburbs generally are more concerned about environmental problems than are people who live in the inner city.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

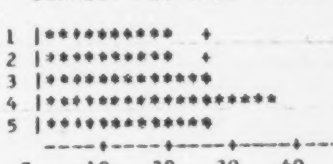
ITEM NUMBER 38
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	0	11	6	8	3	2
2	0	6	6	9	8	0
3	0	5	8	15	3	0
4	0	2	16	21	4	1
5	0	5	8	15	3	0

CHOICES

CORRECT RESPONSE IS 2.

CORRECT RESPONSE CURVE.



DIFFICULTY = 26.67

38. It is more important to preserve the freedom of the individual's choice than to enforce laws to protect the quality of life in the future.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

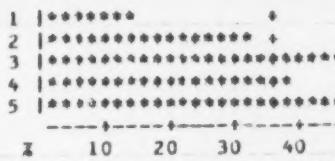
ITEM NUMBER 39
FREQUENCY DISTRIBUTION

GROUP	0	1	2	3	4	5
1	2	4	10	9	4	1
2	2	9	10	1	7	0
3	1	14	9	5	2	0
4	1	17	16	7	3	0
5	0	17	7	4	3	0

CHOICES

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 36.97

39. Industries should not be allowed to contribute to pollution either through production or with the end product.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion

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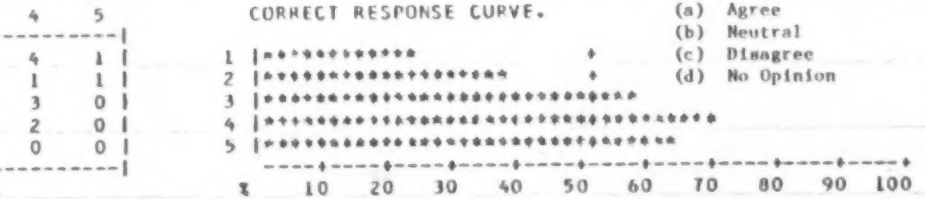
ANALYSIS OF ENVIRONMENTAL EDUCATION TEST INSTRUMENT

ITEM NUMBER 40
FREQUENCY DISTRIBUTION

GROUP	CHOICES 0	1	2	3	4	5
1	2	7	9	7	4	1
2	1	11	12	3	1	1
3	0	18	5	5	3	0
4	0	31	11	0	2	0
5	0	20	7	4	0	0

CORRECT RESPONSE IS 1.

CORRECT RESPONSE CURVE.



DIFFICULTY = 52.73

40. Controls should be placed on industry which will protect the environment even if it means things will cost more.

(a) Agree
(b) Neutral
(c) Disagree
(d) No Opinion